Assessment of the Adoption of the World Health Organization Recommendations for Hospital Nursing Care of Children with Pneumonia in Senegal

Diane Karowitz Dramé

Charlottesville, Virginia

BSN, Niagara University 1974

MSN, University of Virginia 1983

Post-Master's Pediatric Nurse Practitioner, Virginia Commonwealth University 1996

A Capstone presented to the Faculty
Of the University of Virginia in Candidacy for the Degree of
Doctor of Nursing Practice
School of Nursing

University of Virginia

May 2015

Doris F. Glick, PhD, RN _____

Signature of Chair

Mary E. Gibson, PD, RN _____

Signature of Member

Elizabeth Iselin, MD _____

Signature of Member

Abstract

Pneumonia, the leading cause of mortality in children under age 5 years worldwide, is responsible for a significant number of pediatric deaths in Senegal, West Africa. The World Health Organization (WHO) recommendations for pneumonia case management have been shown to be effective in reducing pediatric pneumonia mortality. However global implementation of the guidelines has not been achieved, including a lack of global adoption of the recommendations for the hospital care of children with severe pneumonia. The WHO Pocket Book of Hospital Care for Children: Guidelines for the management of common illnesses with limited resources, contains the internationally accepted guidelines which includes recommendations for the inpatient care of children with severe or very severe pneumonia. Limited information is found in a review of the literature related to the implementation of these guidelines by inpatient health facilities in developing countries. A lack of educational preparation of the staff, a lack of equipment and supplies, and staffing shortages have been identified in some sub-Saharan African hospitals, but it is not known if any of these, or other issues, affect the adoption of the WHO guidelines for inpatient nursing care of children with pneumonia at a first level health facility in Senegal.

This descriptive study used information obtained through a survey of nurses to assess the reported nursing care for children with severe pneumonia in a first level health facility, Hospital Youssou M'bargane Diop, in Rufisque, Senegal and compared the findings with the WHO guidelines for care of hospitalized children with pneumonia. The findings indicate the reported care that is consistent with the WHO recommendations, indicating implementation and adoption of the WHO guidelines. This study found a high degree of nursing procedural confidence and how-to knowledge, indicating the nursing role in this setting is a strong and important

component in the adoption of the WHO guidelines for care for hospitalized children with pneumonia. Two potential barriers were found which could limit the delivery of guideline consistent care; the potential shortage of necessary materials and possible inadequate nursing time.

International nursing research should be encouraged to identify and support nursing expertise that promotes global adoption of the WHO guidelines.

Keywords: pediatric pneumonia, Senegal and healthcare, Senegal and nursing, sub-Saharan Africa and hospitals, sub-Saharan Africa and nursing

Table of Contents

Figures

Appendices

Assessment of the Adoption of the World Health Organization Recommendations for Hospital Nursing Care of Children with Pneumonia in Senegal

Chapter I. Introduction and research question

Overview of problem

Pneumonia is a significant health risk for children in developing countries. Not only is there a higher overall incidence of pneumonia episodes in low income countries, the case fatality rates are significantly higher than found in children living in developed countries. The incidence of pneumonia has been decreasing in many developing countries, including Senegal, due to pneumonia prevention efforts such as immunization campaigns. In addition, the pneumonia mortality rates are decreasing due to the development of primary care pneumonia treatment programs which have provided access to effective treatment for children with simple pneumonia (UNICEF/WHO, 2006). Less attention has been given to the provision of adequate hospital care to treat the children with severe and very severe pneumonia episodes. The lack of adequate hospital care may be a factor in the continued high pediatric pneumonia mortality rates experienced in many developing countries.

Worldwide, pneumonia is responsible for approximately one-fifth of all pediatric deaths (UNICEF/WHO, 2006). A decrease in pneumonia deaths is needed to achieve the United Nations Millennium Development Goal (MDG) #4 to reduce childhood mortality by 66% of the 2000 rates by the year 2015. Although some individual countries are on target to meet the MDG #4, Senegal and most countries in Africa are not likely to have reduced pediatric mortality rates enough to reach MDG #4.

The 2013 global average of pediatric under age 5 years mortality was 46 deaths per 1,000 children, with the majority occurring in low-income countries, where the mortality rates are 12 times higher than in high income countries (United Nations Children's Fund a[UNICEF], 2014). The region with the highest under age 5 years mortality rate is sub-Saharan Africa, where 92 deaths occur per 1,000 children (UNICEF a, 2014). The disparity between low and high income countries is evident when comparing Senegal, West Africa, where the under age 5 years mortality rate in 2013 was 55 deaths per 1,000 children, about 6 times higher than the mortality rate in the United States, where the mortality rate is 6 deaths per 1,000 children (UNICEF b, 2014). Although significant progress has been made in Senegal, with a decrease from 351 per 1,000 deaths in the 1970s to 86 per 1,000 in the 2000s (Ragaratnam, Marcus, Flaxman, Wang, Levin-Rector, Dwyer, Costa, Lopez & Murray, 2010), the most recent rate of 55 per 1,000 is still above the MDG goal of 47 per 1,000 (UNICEF a, 2014). Currently, the pediatric mortality ranking for Senegal is 43rd highest of 182 countries worldwide. The United States ranking is 150 (UNICEF b, 2014). In addition to the pediatric mortality rates, infant and maternal mortality rates in Senegal are also high and the life expectancy in Senegal is 63 years, well below life expectancy in developed countries (UNDP, 2014).

The leading cause of childhood death worldwide is pneumonia, responsible for about 18% of all under 5 childhood deaths (UNICEF, 2013). Pneumonia and diarrheal illnesses combined account for 2 million pediatric deaths annually (UNICEF, 2013). Unfortunately, the impact of infectious diseases on children's health in sub-Saharan Africa is enormous. The majority of pediatric deaths are caused by an infectious disease, or as a result of a combination of successive or repeated infectious illnesses. In addition, malnutrition is also a contributing factor in one-third of childhood deaths worldwide (UNICEF, 2013). For example, a study from the

Gambia, a country completely enclosed within Senegal except for its coastline, found 80% of the child mortality was due to infectious diseases (Rutherford, Dockerty, Jasseh, Howie, Herbison, Jeffries, Leach, Stevens et al, 2009).

Unfortunately, the disparity between developed and developing countries is also seen with pneumonia case fatality rates. Pneumonia is more likely to be lethal in developing countries where the pneumonia case fatality rate is about 15%-20% (Greenwood, Weber & Mulholland, 2007). Another significant factor in pneumonia mortality is age. Children and adults over age 75 years in both developed and developing countries have a significantly higher incidence of pneumonia compared to adults under 75 years old (McIntosh, 2002). The majority of pediatric pneumonia deaths worldwide occur in children under 1 year of age (Rudan, Boschi-Pinto, Biloglav, Mulholland & Campbell, 2008). Unfortunately, the percentage of children in Senegal who succumbed due to pneumonia did not decrease in a decade, with 16% of all childhood deaths due to pneumonia in both 2000 and in 2010 (WHO 2013). Although multiple issues such as malnutrition, co-morbid illnesses, and a lack of public records affect the accuracy of mortality statistics in Senegal, pediatric mortality is clearly very high and pneumonia is a significant cause in the death of many young children.

The continued loss of life is tragic because most pediatric deaths due to infectious diseases can be prevented. In addition, both pneumonia and diarrheal illnesses are highly treatable. An estimated 65% of pneumonia deaths worldwide could be prevented with antibiotics, which could potentially decrease worldwide childhood mortality by 6 % (Jones, Steketee, Black, Bhutta & Morris, 2003). The greatest impact in reducing mortality could be achieving by focusing on decreasing deaths from easily treatable infectious illnesses such as pneumonia, in high risk areas such as Senegal, and with high risk populations such as infants.

Since 2000, the increased focus on meeting MDG #4 has increased awareness of the substantial impact of pneumonia deaths on global pediatric mortality. As a result, this global priority has led to increased efforts to reduce the morbidity and mortality of pneumonia. The World Health Organization and UNICEF collaborated to develop the 'Global Action Plan for the Prevention and Control of Pneumonia' (GAPP) in 2009, with the specific aim of improving the accessibility of known effective interventions, both in preventing and treating pneumonia worldwide (WHO, 2009). In 2010, 'Pneumonia: The forgotten killer', a global educational campaign was released and the first annual "World Pneumonia Day" to increase global awareness occurred on November 11, 2011. Another large initiative with 40 billion dollars of funding, the "Global Strategy for Women and Children's Health" was developed to address the progress towards meeting the MDGs, and included specific pneumonia intervention plans (United Nations Secretary General, 2010).

In 2013, the Global Action Plan for Pneumonia and Diarrhea (GAPPD) was launched and incorporates the recommendations for preventive interventions to promote healthy children, which aims to reduce the incidence of both diseases, and includes specific case management strategies for both pneumonia and diarrhea illnesses (UNICEF/WHO, 2013). The goals of this program include reducing pneumonia mortality in children under age 5 years to 3 per 1,000 and reducing the incidence of severe pneumonia by 75% of 2010 rates by 2025. One of the targets of the program is for 90% of children worldwide to have access to appropriate pneumonia and diarrhea case management services (UNICEF/WHO, 2013). Improving case management for both primary care and in-hospital care services through increased use of the WHO recommendations worldwide is necessary to meet these targets. In 2012, the International Vaccine Access Center from John Hopkins University studied the implementation of the GAPP

program in the 15 countries with the highest pneumonia deaths, using the percentage of children receiving antibiotics as an indicator of adequate treatment. They found the highest treatment rates in Kenya and Pakistan where 50% of children with pneumonia were treated with antibiotics and the lowest treatment rate, only 5%, was found in Ethiopia (International Vaccine Access Center, 2012).

Clearly, many children are not receiving the basic primary care treatment of pneumonia. This also would suggest the children diagnosed with severe or very severe pneumonia are also not receiving the recommended hospital care, which is more complex to provide, requiring a physical space, specific supplies and equipment, and educated nurses and physicians to deliver health care services. Often primary care can be provided in communities by minimally trained, volunteer or illiterate community health workers, who are not able to provide treatments such as the administration of medications (especially via intramuscular, intravenous and nasogastric routes), administration of nasogastric feedings to prevent dehydration, delivery of supplemental oxygen and ongoing skilled nursing assessment as recommended by the WHO in the 'Pocket Book of Hospital Care for Children: Guidelines for the management of common illnesses with limited resources', published in 2005 (WHO, 2005). The WHO guidelines are the internationally accepted clinical practice recommendations for the care of ill children at first level health facilities, which are generally local general hospitals, in low resource settings. A second edition of the guidelines was released in English in December 2013, and was not available in French as of August 2014.

Use of the WHO guidelines for care of children with pneumonia in health facilities is important to reduce pediatric pneumonia mortality, and information about current implantation

of the guidelines is needed in order to understand how to improve adoption of the guidelines and reduce pediatric pneumonia mortality.

Purpose of the Study

Pneumonia is a leading cause of preventable childhood mortality and WHO case management recommendations have been shown to be effective in reducing mortality, yet it is not known if the recommendations have been adopted in first level health facilities in sub-Saharan Africa. Guidelines are clinically useful in providing a trusted reference rather than referring to primary studies to obtain evidence-based recommendations for care (Harrison, Legare, Graham & Fervers, 2010) and the use of guidelines and guideline adherence has been studied in various settings. An assessment of current practice and comparison with the WHO guidelines was needed to determine if the guidelines have been adopted for inpatient nursing practice in the care of children with pneumonia. The purpose of this study is to compare the reported nursing care in a first level health facility in Senegal with the WHO guidelines for care of children with severe pneumonia, report strengths in guideline implementation, and identify barriers to the adoption of the guidelines.

Theoretical Framework

The ‘’Diffusion of Innovation’ Theory is used in this study to guide the assessment of the adoption of the WHO “Pocket book of hospital care for children’ recommendations for the care of children with pneumonia. The ‘Diffusion of Innovation’ theory, developed by Everett Rogers in the 1960’s, describes the components and process involved in the adoption of changes or innovations. Rogers saw diffusion and adoption as complex multistep processes, which occur in a variable manner and rate, and are affected by multiple factors within different settings. The ‘Diffusion of Innovation’ framework (Figure 1) indicates the steps to adopting the innovation as

knowledge of the innovation, persuasion (or interpretation) of the adopter, decision to adopt, implementation of the innovation and confirmation of adoption (Roger, 2005). Rogers identified components within the steps which can promote, delay or prevent the adoption of the innovation. Three of these components are addressed in this study. The first is knowledge of the innovation, or awareness of the guidelines. The survey asks whether the nurses are aware of the guidelines and the specific recommendations of the guidelines.

The second component studied relates to the characteristics of the innovation or guideline factors, which are factors necessary in order for the guidelines to be followed. In this situation, the guideline factors are the specific equipment, supplies, medications and adequate nursing time needed in order for the nursing practice to be consistent with the guidelines. For example, the guidelines recommend the delivery of oxygen for children with respiratory distress, which requires the guideline factors of oxygen source and oxygen supplies to be available for administration by the nurses.

The third component, characteristics of the innovators or people factors, is assessed in two areas. One area, nursing procedural confidence assess whether the nurses have been adequately prepared to confidently complete the necessary skilled nursing procedures required in the guidelines. The second area of people factors is the assessment of how-to knowledge, which indicates whether the nursing care delivered is consistent with the specific nursing practice recommendations in the guidelines.

The strengths were assessed by identifying the components with the most positive indications of guideline adoption. The barriers were identified in the survey through questions which asked the nurses if the availability of the guideline factors, materials and nursing time, impacted their ability to provide 5 nursing procedures recommended in the guidelines.

Study Questions

1. Have the WHO recommendations for the hospital care of children with pneumonia been adopted for the delivery of care by nurses in a first level health facility in Senegal?

2. Do barriers exist which hinder the adoption of the WHO guidelines for hospitalized children with pneumonia?

Chapter II. Review of the literature

A review of the literature was completed in 3 main topic areas which relate to the inpatient care of children with pneumonia in Senegalese health facilities. The topics included global pneumonia issues, hospital care concerns in developing countries, and healthcare issues in Senegal.

The global pneumonia issues addressed in this paper are the history of global pneumonia programs, lack of immunizations, inadequate antibiotic treatment, barriers to seeking treatment, pneumonia case management programs and the lack of case management programs.

The hospital care concerns in developing countries addressed in this paper are barriers to hospital care, inpatient care concerns in low resource areas and inpatient care of patients with pneumonia.

Four aspects of health care in Senegal were reviewed: health care resources, health care providers, case management services and access to healthcare in Senegal.

Literatures searches were conducted using Medline, CINAHL and World Cat databases using the search terms pneumonia, respiratory infection, and acute respiratory infection; with additional search phrases of pediatric, childhood, global, international and worldwide. To obtain information related to children's health in Africa and Senegal, the search terms of Africa and Senegal were used with search phrases of childhood, pediatric, health, healthcare, nursing, nurses and/or hospitals. In addition, the reference lists of articles found in these searches were reviewed to find additional articles related to pediatric pneumonia and healthcare in Africa and Senegal.

Literature Summary

Global pneumonia issues.

History of global pneumonia programs. Programs to decrease respiratory illness mortality worldwide have evolved over several decades prior to the current recommendations developed by the WHO. One issue in the development of the guidelines was concern about the differences in diagnostic criteria between developed and developing countries. In developed countries, pneumonia is generally diagnosed using chest x-ray findings in addition to history and physical exam findings (Scott, Brooks, Peiris, Holtzman & Mulholland, 2008). However chest x-rays are not available in many settings in developing areas and even a stethoscope for use during the clinical exam may not be available. The World Health Organization (WHO) has developed simplified diagnostic criteria for pneumonia diagnosis in low resource areas, where trained health care workers and supportive diagnostics are not available. The WHO pneumonia diagnosis criteria do not require use of a stethoscope, lab testing, or chest x-ray findings but use clinical signs of cough, difficulty breathing and fast breathing as diagnostic indicators of pneumonia. The pneumonia is classified as severe if the infant or child also has chest wall indrawing, commonly referred to as retractions by healthcare providers in the United States. Very severe pneumonia is diagnosed when central cyanosis, severe respiratory distress, lethargy, and/or inability to drink are also present. These simplified diagnostic guidelines have been validated and found to be effective in diagnosing pneumonia in low resource settings. For example, one of the earliest large multi-country evaluations, completed in 1992, found 80% agreement in diagnosis between pediatricians utilizing chest x-rays findings, and health care workers with one day of training who did not have chest x-ray capability (Mulholland, Simoes, Costales, McGrath, Manalac & Gove, 1992). One criticism of the diagnostic criteria is the

inability to distinguish viral infections from bacterial pneumonia, which results in the treatment of viral infections with potentially unnecessary antibiotics. However, the World Health Organization estimates 70% of deaths from acute respiratory infections in developing countries are due to bacterial pneumonia (World Health Organization, 2008) and the potential for significantly reducing mortality outweighs the risk of overtreatment of nonbacterial pneumonia.

Using the WHO guidelines for care of children with pneumonia has been shown to be effective in reducing pediatric mortality. One very large successful program in Nepal provided case management services by community health workers for treatment of childhood pneumonia for over 20 years and as a result, the under five year mortality rate due to pneumonia was reduced by 50% (Dawson, Pradham, Karki, Poudel & Hodgins, 2008).

Pneumonia case management programs. Pneumonia case management is effective in reducing mortality. One of the first studies on the impact of pneumonia on global health was published in 1985 by Berman and McIntosh, "Selective Primary Health Care: Strategies for Control of Disease in the Developing World: Acute Respiratory Infections". They recognized the areas with highest rates of pneumonia are the most difficult areas to provide services, therefore the most effective method to reach the children in need was to utilize nurses or other community health care workers trained to diagnosis and treat respiratory infections in areas where physicians are not available (Berman and McIntosh, 1985). In the 1990's, the World Health Organization developed a global case management program, the Acute Respiratory Infection (ARI) program, which utilized community health workers to provide the case management services, patterned after a successful case management program to reduce diarrheal disease illness. Both programs were incorporated by the WHO into a comprehensive case management program, the Integrated Management of Childhood Illness (IMCI) in 1996. The IMCI program has been found to be very

effective, although worldwide adoption and use of the guidelines has not yet been achieved. The IMCI guidelines can be used by health care workers or volunteers to provide outpatient pneumonia treatment with antibiotics. This strategy has significantly increased the availability of case management services for the treatment of childhood pneumonia to many children in the more remote areas of the world. A systematic review of studies completed in the 1980's found case management utilizing trained health workers was effective in poor rural areas where a 30% reduction of pneumonia mortality was achieved (Rasmussen, Pio & Enarson, 2000). A recent comprehensive systematic review of community case management studies in the 2000's again found case management effectively reduced pneumonia mortality. The researchers predicted pediatric pneumonia mortality could decrease by 70% if all children received case management services (Theodoratou, Al-Julaihawi, Woodward, Ferguson, Jhass et al, 2010).

Lack of case management services. It has been estimated as many children as 50% of children worldwide do not have existing health facilities available for delivery of case management services (Mulholland, 2007). Children in remote, rural and high poverty areas are more likely to need longer travel distance to access care. One issue which has led to a lack of case management services for children has been the inadequate funding of programs. Although case management services are shown to significantly reduce mortality, only 1-2 % of funding from outside sources for maternal child programs have been utilized for development of integrated case management services (Powell-Jackson, Borghi, Mueller, Patouillard, Mills et al, 2006). One reason for the low level of funding for pneumonia programs has been the worldwide focus on reducing the impact of HIV/AIDS, TB, malaria and malnutrition (Mulholland, 2004). Reducing the incidence of malaria, HIV/AIDS and tuberculosis would decrease overall pediatric mortality rates, however pneumonia is responsible for more pediatric deaths than the combined

total of HIV/AIDS, malaria and tuberculosis related deaths annually (World Health Organization, 2008). Pneumonia treatment is less complex and less costly, which results in pneumonia funding being very cost effective in addition to having a more significant reduction in pediatric mortality rates. Increased funding of pneumonia programs could have a significant impact on reducing global mortality rates.

Inadequate antibiotic treatment. Most simple (i.e. not severe) pneumonia is highly treatable with common, low cost oral antibiotics (Cochrane Review, 2008) and the Severe Pneumonia Evaluation Antimicrobial Research (SPEAR) study, a large multicenter, multicounty, randomized controlled trial found two low cost antibiotics, ampicillin and gentamycin, were effective for the treatment of severe pneumonia in children (Asgha, Banajeh, Egas, Hibberd, Iqbal, & Katep-Bwalya, 2008). Although low cost antibiotic treatment is highly effective, it is estimated only 31% of children with pneumonia worldwide receive antibiotics (UNICEF/WHO, 2013) and as noted above, the recent study of GAPP programs indicated antibiotic treatment rates were only 5% to 50% in 15 developing countries. Clearly, obtaining antibiotic treatment for children with pneumonia is a very significant problem globally (International Vaccine Access Center, 2012).

Barriers to seeking treatment. Another global pneumonia issue is the existence of barriers to seeking treatment. Seeking health care services can be complicated for caretakers in many developing countries. Caretakers living in rural areas, with less maternal education and with lower socioeconomic status are less likely to seek health care services for ill children (Kallander, Hildenwall, Walesa, Galiwango, Peterson & Pariyo, 2007). In addition, caretakers who did utilize health care services may delay seeking care until the child is very ill. In one study, the median duration from recognition of illness to seeking outside care was 2 days and the

median duration from first treatment to death was 7 days, which indicates even when healthcare services are obtained, it may be delayed and not the first option sought for treatment (Kallander, et al, 2007). In some areas, caretakers do not seek healthcare services due to barriers such as geographic distance, lack of transportation and/or lack of funds to obtain transportation. A study in Uganda found only 60% of children lived within one hour walking distance of a health care center and another study in Kenya found children living in rural areas had a higher mortality risk, likely related to limited accessibility to health care centers (English, Esamai, Wasunna, Were, Ogutu & Wamae, 2009). The delay in seeking care contributes to the high mortality rates in health facilities and high global pediatric mortality.

Caretakers may not seek care for children because they do not recognize the signs of pneumonia and may not be aware effective medical treatment may be available. "Pneumonia: the forgotten killer" reports only one in five caretakers knew the two tell-tale symptoms of pneumonia: fast breathing and difficult breathing (UNICEF, 2007). UNICEF also reports only 6% of people are aware that difficult breathing is a sign indicating the need to seek care immediately. A study in Nigeria found almost 40% of mothers were not aware that difficulty breathing was a sign of pneumonia and 75% did not known that cough was also a symptom. Many of the mothers who were aware of pneumonia symptoms reported having a child diagnosed with pneumonia in the past (Uwaezuoke, Emodi, & Ibe, 2002). Similarly in Pakistan, mothers with prior experience with childhood pneumonia were more likely to identify fast breathing in their children and seek care earlier than mothers who did not have prior experience with pneumonia (Kundi, Anjum, Mull & Mull, 1993).

Use of traditional practices may also reduce the use of health care services. A study from Senegal, found cultural beliefs and taboos influenced care seeking and lead people to seek

traditional sources as the first resource for treatment of illnesses (Ndiaye et al, 2004). Prior to seeking care, children may be treated with medications at home first without seeking advice from a health care worker, using medications available from drug stores, local shops, neighbors or medications already in the home (Kallander et al, 2007). A Ugandan study found only one-quarter of the children with pneumonia were given antibiotics at home by their caretakers and one-half of the children dying from pneumonia were treated at home with antimalarial medications (Hildenwall, Nantanda, Tumwine, Petzold, Pariyo, Tomson, & Peterson, 2009). These barriers to seeking health care services are preventing or delaying the treatment of many children with pneumonia and likely affect pneumonia mortality rates.

Lack of immunizations. Immunizations have significantly reduced mortality from infectious diseases over the past 60 years in developed countries. Pneumonia pathogens have been found to be similar worldwide, which indicates full immunization would probably decrease pneumonia incidence in developing countries as it has in developed countries. Hemophilus influenza type B (HIB) was a leading cause of pneumonia in the United States prior to the introduction of routine hemophilus (HIB) vaccine in 1980s but since routine immunization with HIB vaccine has been implemented, the rate of invasive hemophilus infections in the USA and Western Europe has been decreased by 99% (Center for Disease Control, 2008). Streptococcus pneumoniae (pneumococcal) was also a common cause of pneumonia in the United States but is now seen infrequently since mass immunization with the Prevnar vaccine (Center for Disease Control, 2009). Hemophilus influenzae (HIB) and streptococcus pneumoniae (pneumococcal) organisms were accountable for about 50% of childhood pneumonia in an African study (Mulholland, 2007), which again suggests the widespread use of immunizations will be helpful in decreasing African pneumonia rates. Currently, immunization rates are at the highest levels

ever worldwide, but approximately 23.2 million children are not fully immunized resulting in an estimated 1.7 million children still dying annually from vaccine preventable diseases (Global Alliance for Vaccines and Immunizations, 2011). Despite immunizations programs receiving about one-half of international health funding (Powell-Jackson, Borghi, Mueller, Patouillard & Mills, 2006), about one-fifth of children worldwide are not receiving any immunizations (Global Alliance for Vaccines and Immunizations, 2011).

Hospital Care Concerns in Developing Countries.

Barriers to hospital care. Mortality statistics indicate many children in developing countries die in the home or community, not in hospitals (UNICEF, 2010). This suggests if the very sickest children are not being treated in hospitals, it is likely children with less critical illnesses, such as many severe pneumonia episodes, are also not being treated in hospitals. A study in Malawi found one-half of in hospital pediatric deaths occurred in the first 24 hours (Molyneux et al, 2001), again indicating a delay in seeking health care services until the children are critically ill.

Several factors have been found which influence seeking hospital care in developing countries. One issue identified by caretakers is social constraints, which influence attitudes and prevent hospital care from being an accepted social option in some communities (Rutherford, Dockerty, Jasseh, Howie, Herbison et al, 2009). In Tanzania, caregivers reported feeling the hospitals were unclean and overcrowded, and in addition they did not like sharing beds with other ill children (Mwangi, Chandler, Nasuwa, Mbakilwa, Poulson, Bygbjerg & Reyburn, 2008). Parents were concerned about the difficulty feeding their children because food was not provided by the hospital and the families did not have areas for preparing their own food (Mwangi et al, 2008). In Bangladesh, barriers to hospitalization included not having adequate money for

treatment, a lack of transportation, and a lack of someone to prepare meals in the home if the mother was not present (Chowdhury, Arifeen, Rahman, Hogue, Hossain, Begum, et al, 2008). A large observational study found asking family members to provide payment for emergency medications before the medications were given to the child was a common practice, which also resulted in delays or inadequate treatment ((Nolan, Angos, Cunha, Muhe, Qazi, Simoes, Tamburlini, Weber, & Pierce, 2001).

Not all caretakers pursued hospitalization even when recommended by the health care provider they consulted for health care services. A large study in Bangladesh found two-thirds of the children diagnosed with severe or very severe pneumonia and referred for hospitalization were not hospitalized, again due to barriers of geographic distance, inadequate finances, and social constraints (Chowdhury et al, 2008). Additionally, the opposite situation also occurred in which the health care workers did not refer for hospitalization when indicated by the guidelines, possibly because hospitalization was not thought to be feasible. A facility in Tanzania utilized the WHO guidelines; however less than one-fifth of children who meet the criteria for referral to a higher level facility were actually referred (Armstrong Schellenberg, Adam, Mshinda, Masanja, Kadadi, Mukaso et al, 2004). In that setting, the majority of the centers were more than two hours travel distance from a hospital (Armstrong Schellenberg, et al, 2004) and the providers felt hospitalization was not an option. The barriers to hospital care which influence both care takers and health care providers need to be reduced and the identification of hospitals where guideline appropriate care is available may reduce distrust in hospital care and improve hospitalization rates.

Inpatient care concerns in low resource areas and sub-Saharan Africa. Mulholland et al (2007) felt many hospitals in low income countries are part of dysfunctional health care

systems, and as a result of inadequate care, the pneumonia case-fatality rates can be as high as 15-20% in some hospitals. Hospital care in general is identified as a weak aspect of many health care systems in low resource settings (Nolan et al, 2001). Historically, little information has been available related to pediatric outcomes of hospital care in low income countries (Nolan et al, 2001) and few studies are found related to pediatric nursing care in sub-Saharan African hospitals (Mulholland et al, 2007).

One study of pediatric hospital care in the 1990's indicated inadequate staffing, deficiencies in assessment, lack of appropriate protocols and lack of equipment, supplies and medications are all significant issues in the delivery of care in low resource settings. This observational study of pediatric inpatients in 21 hospitals in 7 countries found 60% of the children received inappropriate treatment with antibiotics, fluids, feedings, or oxygen. Three-quarters of the children treated as inpatients received inadequate assessment, treatment, or monitoring. In addition, 2/3 of the hospitals did not have a triage system to direct resources needed emergently, which lead to delayed care for the sickest patients (Nolan et al, 2001). The study also surveyed twenty three nurses and medical assistants to assess their knowledge of common problems and found significant knowledge gaps with over 90% having a lack of knowledge in at least one area tested (Nolan et al, 2001).

A more recent review of pediatric emergency and critical care in low income countries again found many hospitals need improved pediatric services (Baker, 2009). Prioritization of care so the sickest are cared for first was an important goal identified by Baker (2009) who found a lack of a triage system again impacting health care service delivery. This study again noted many hospitals in low resource areas do not have emergency rooms, critical care areas, and also lack specific areas for children (Baker, 2009). A study in Malawi found mortality was reduced

by 4%-10% solely through establishing an emergency department triage service (Molyneux et al, 2006) to direct care to the sickest children first.

Baker (2009) reported staff working in low resource settings may have a 'sense of fatalism' because they may not be aware the children can survive with appropriate treatment and instead may feel children are too ill for treatment to be effective. Increased staff training was identified as very important with recommendations to concentrate on teaching the basics (ABCs) of treating the most common emergency situations (Baker, 2009).

Three studies were found related to pediatric hospital care in low resource settings since the observational study in 2001. A study in Tanzania also found significant deficiencies in basic nursing assessment. Only one-half of inpatient children had a weight documented and less than 10% of the children had documentation of their level of consciousness or ability to take oral liquids (Reyburn, Mwakasungula, Chonya, Mtei, Bygbjerg, Poulson & Olom, 2008). Another important nursing skill, the monitoring of vital signs was inadequate. Respiratory rate was documented in only 15% of the 193 children diagnosed with pneumonia (Reyburn et al, 2008).

In Malawi, many issues were found in pediatric hospital care of children with pneumonia, such as a lack of supplies, antibiotics and oxygen in addition to finding the hospital staff had inadequate clinical skills. A successful project, developed by the government of Malawi with foreign funding, effectively reduced the pediatric pneumonia mortality rates in the public hospitals by one-half, from 200 deaths per 1,000 children under age five years to 100 deaths per 1,000 children, which is greatly improved but still elevated. The mortality was reduced over a five year period using case management guidelines to establish appropriate management of supplies and materials, staff training and monthly evaluations to improve care delivery (Enarson

et al, 2009). This study clearly shows pneumonia mortality can be reduced with appropriate hospital care and the guidelines are valid standards by which hospital care can be evaluated.

Although information on pediatric nursing or hospital care for children with pneumonia in Senegal is not found, one study was found in which WHO guidelines were utilized and evaluated for the care of children with malaria. The study was completed in the one pediatric academic hospital in Senegal, which was experiencing high mortality rates for children with severe malaria and poor prognostic factors such as coma, respiratory distress, and hypoglycemia. The hospital was able to implement the WHO guidelines and the mortality rates were reduced (Camara, Diagne-Gueye, Faye, Fall, P., Fall, M., Ndiaye, Ba, & Sow, 2007).

Pneumonia inpatient services. Several studies have found pneumonia inpatient services were limited by the availability of adequate materials to comply with the guidelines. Oxygen administration is critically important for treatment of children with pneumonia and oxygen therapy alone may improve survival from pneumonia (Enarson, P., Gie, Enarson, D. & Mwansambo, 2009). An estimated 122,000 children with pneumonia would survive annually if oxygen delivery was available worldwide and about 1.5-2.7 million children would benefit from oxygen therapy per year, if it were available (Catto, Zgaga, Theodoratou, Huda, Nair, Arifeen, Rudan, Duke & Campbell, 2011). In New Guinea, a controlled study found the use of oximetry and oxygen decreased pneumonia deaths by one-third (Duke, Wandi, Jonathan, Matai, Kaupa, Saavu, Subhi, & Peel, 2008). However the delivery of oxygen therapy has been found to be lacking in developing countries, where the highest incidence of pneumonia indicates a great need for oxygen therapy In Kenya, a study of 14 hospitals found there was a limited oxygen supply and lack of equipment, such as nasal cannulas and flow meters (English, Esamai, Wasunna, Were, Ogutu, Wamae, Snow & Peshu, 2004). Financial factors also impact the delivery of

oxygen. The cost of oxygen therapy is approximately $50 per child, which increases the average fee for hospital admission for severe pneumonia by one-third (Duke et al, 2008), which the caretakers would likely by expected to pay for at the time of service. In addition, a lack of trained nurses needed in hospitals to monitor and deliver oxygen therapy may reduce the appropriate use of oxygen.

Information about the availability of oxygen in hospitals in Senegal was not found in the literature, but a study of childhood deaths in nearby Gambia reported of 82 children who died in a hospital, only one child had received oxygen (Kuti, Adegode, Ebruke, Howie, Oyelami & Ota, 2013), which suggests oxygen delivery may also be an issue in other countries of West Africa.

Providing medication and fluids via nasogastric tubes is another important aspect of hospital nursing care which can improve survival rates for children with pneumonia, which may cause a period of respiratory distress and fatigue during which the child is unable to take medications and liquids by mouth. Supplies and nursing skill are needed to avoid preventable deaths due to dehydration and a lack of antibiotic treatment. Although this aspect of nursing care can be very important in the survival and recovery of ill children, there is a scarcity of information related to nasogastric tube feedings for children in Africa. The only study found related to nasogastric tube feedings for children was completed in 17 hospitals in eastern European and found nasogastric feedings in general were rarely used (Duke, Keshishian, Ostergren, Ryumina, Stasii, Weber, & Tamburlini, 2006). This raises the question of whether hospitals in other low resource settings are not be able to provide the supplies and nursing skill to deliver nasogastric tube feedings to support children and prevent dehydration deaths in acute illnesses.

Although the information about hospital care of children in sub-Saharan Africa is very limited, the overall picture suggests hospital care may not be adequate to avoid preventable childhood mortality due to pneumonia.

Health and healthcare in Senegal.

Health indicators in Senegal. The Republic of Senegal, a sub-Saharan West African country which is slightly smaller in size than South Dakota. From an economic standpoint, Senegal is a low resource, developing county with a ranking 163 of 187 countries on the UN Human Development Index (United Nations Development Programme (UNDP), 2014). There is significant poverty in Senegal; approximately 30% of the population in Senegal lives on less than $1.25 per day (UNDP, 2014). Of the approximately 14 million residents of Senegal, about 3 million people live in Dakar, the capital city and about 60% of the population resides in rural areas. However this demographic is changing with increased migration of rural populations to the overpopulated cities and suburban shantytowns, which is also changing health care needs (Ndiaye, Ndir, Hane, Michel & Bousquet, 2004),

Senegal was a French colony before being established as an independent democratic country in 1960 and French continues to be the language used in business, government, education and healthcare, including medical literature. Education, from primary school through universities, is taught in French, but education is not universal in Senegal. The adult literacy rate is about 50% and school attendance averages 4.5 years (UNDP, 2014). With the majority of Senegalese citizens not fluent in French, the number of potential candidates for educational programs such as nursing degrees, where both reading and writing skills in French are required, is limited. About 35 African languages are used in homes and local communities in Senegal. About one-fifth of the Senegalese population is ethnically Wolof, and many more people use the

language of Wolof as a common language for business and trade. The use of multiple languages also affects the development of individual and community health education programs. In Senegal, 95% of the population is Muslim and religion is an important aspect of Senegalese life.

The high under age 5 years mortality rates in Senegal were confirmed in studies from two hospitals in Senegal. One study from National Albert Royer Children's Hospital in Dakar found in over 9,000 hospital admissions during the year period from 1998 to 2001, there was a mortality rate of 16 % with 11% of the deaths due to malaria, which is a common infectious illness impacting the health of many children in Senegal (Camera, Diouf, Faye, Ba, Sow & Kuakuvi, 2005). The second smaller study of hospitalized children in Senegal also found the high mortality rates and a high pneumonia case fatality rate. Of 114 children treated in a rural hospital, one-quarter were admitted for respiratory illness with one-half of these children diagnosed with pneumonia. All of the children with pneumonia were under 2 years of age and 4 children with pneumonia did not survive, for a 33% pneumonia case fatality rate (Eshave, Bille, Audet, Talla, Vaudaus et al, 2003). HIV/AIDS infections which have led to an increased incidence of pediatric pneumonia in many sub-Saharan African countries, is not highly prevalent in Senegal., with an incidence of 0.5%, and therefore does not significantly impact pediatric pneumonia incidence or mortality rates (UNICEF b, 2014).

The Senegalese Ministry of Health has developed a national health plan with the goal of reducing maternal and child mortality to work toward meeting the MDG goals, however government spending on health care in 2012 was 5% of the gross national product (GNP), or the equivalent of $96 (US dollars) per person per year (WHO, 2012), which is not unlikely to fund the programs necessary to reduce mortality. The public health system in Senegal is decentralized with each region of the country responsible for the management and funding of local services

(Foley, 2010). There are seventeen regional public hospitals, one in each region of Senegal. The hospital is the base of operations for the regional public health services, with a chief medical officer in charge (Ndiaye, 2004). Within each region are districts with small first level health facilities, generally providing 10-20 inpatient beds at each site (USAID, 2010). Each district has a chief physician in charge, "medecin-chef de district" [MC] (Foley, 2010). Within districts are smaller health posts, or "postes de santé," run by a head nurses, "infirmier-chef de poste" (ICP). The district head nurses also provide supervision of the village health huts, which are usually staffed by community health workers (Foley, 2010). The smaller health posts, about 800 in total, each serve about 11,000 people each. About 1400 'village health huts' serve more remote and rural areas, often staffed with volunteer community health workers (Ndiaye et al, 2004). The community health workers are trained and provided with medications to treat common illnesses, such as pneumonia and malaria (Foley, 2010).

The public health system charges fees for service (USAID, 2009). Most payments for health care services are expected at the time of service use and service can be delayed until payment is received (Foley, 2010). Private and charity hospitals exist in Senegal, although the number, size and services provided could not be found in the literature.

In Senegal, there are approximately 3 hospital beds available per each 10,000 people. In comparison, the USA has 31 beds per 10,000 people and the global average is 27 beds per 10,000 people (WHO, 2013). The lack of hospital beds could have an impact on pediatric mortality in Senegal.

Health care providers in Senegal. Nursing education in developing countries can be highly variable and shortages of nurses have been found to impact the delivery of hospital care. In Senegal, the nursing education system is similar to the French model with basic entry to

practice obtained from 2 year non-university nursing schools. Nursing is in the early stages of developing as a profession in Senegal. In 1972, there were only 458 registered nurses in Senegal (Dieng, 1974), which has increased to over 3,300 nurses in 2006, or about one nurse per 4,200 people (USAID, 2010). However, between one-quarter to one-third of Senegalese born nurses were working outside of Senegal in 2002, a trend which continues to reduce the available pool of nurses for hospitals in Senegal. The ratio of nurse per population in the Unites States is 9.8 nurses per 1,000 people, or 40 times more nurses per population in the U.S. than in Senegal. Senegal also has fewer than the worldwide average of three nurses per 1,000 people. Senegal's availability of nurses ranks 163 of 187 countries worldwide (WHO, 2013). The shortage of nurses could affect the adoption of WHO guidelines for inpatient care, which requires educated, literate and skilled nurse to provide care in accordance with guidelines.

In addition to the overall shortage of health care workers (nurse, physicians, and midwives), another issue affecting healthcare in Senegal is the concentration of health care workers in the capital city, Dakar, which results in many fewer workers being available in the other areas of the country. Twenty-three percent of the population of Senegal lives in Dakar, the capital city, where 60% of the countries physicians and about 34% nurses are employed (Zurn, Codija, Sall & Braichet, 2010). One article reported on a project to address the critical issue of disproportionate urban health care workers. In 2006, the policies of the Ministry of Health were changed to promote better recruitment and retention of healthcare workers. Prior to the project, the workers were deployed to health posts as needed to provide services throughout Senegal without being able to choose the location of their employment or the length of time spent in each location. (Zurn et al, 2010). The new system, Plan Cobra, allowed health care workers to contract for work in a specific health post for a specified period of time. Also, special benefits were

provided, such as free housing, for workers willing to work in remote and rural areas (Zurn et al, 2010). Health posts which did not have workers prior to the project were able to be reopened and health care services were improved (Zurn et al, 2010).

The effect of severe shortages of health care workers in Senegal is not known, but may create barriers to the delivery of care consistent with guidelines if adequate staffing or nursing time is not available.

Case management in Senegal. Successful primary care case management programs for the treatment of pediatric pneumonia have been developed in Senegal. The BASICS III program, developed with the United States Agency for International Development (USAID), improved community case management of pneumonia in 22 district health huts operating with community health workers trained to use IMCI guidelines. A study of the programs' effectiveness found 42% of the children evaluated at the health huts were treated for respiratory illnesses and 99% of the outcomes were successful (USAID, 2010). Another program to promote the use of WHO primary care guidelines for treating pneumonia in Senegal provided a 3 day training program for community health workers. A review of care after 6 months found the community health workers had a 90% success rate in diagnosing and treating 3000 children with pneumonia (Sylla, Gueye, Ndiaye, Diouf, Fall, Moreira, & Sall, 2006). However the community health workers were not as successful in the diagnosis of severe pneumonia. About 28% of children with severe pneumonia were under diagnosed as simple pneumonia and 10% of children with severe pneumonia were treated with antibiotics, but not referred for hospitalization. Also, about one-fifth of children treated with antibiotics did not meet the diagnostic criteria for pneumonia (Sylla et al, 2006). Overall, about 23% of children with respiratory infections in Senegal are managed by volunteer health care workers in the primary care setting (Sylla et al, 2006) Through cooperative efforts

with USAID, over 6,000 volunteers were trained to treat pneumonia in 2008 and Senegal is viewed as a model country for the development of community health programs (USAID, 2011).

In the one study of guideline adoption in health facilities in Senegal, the adoption of WHO pediatric nurse case management for care of children with malaria was not as successful as the community program for case management of pneumonia. In this study, an assessment of health facility nurses treating outpatient and inpatient children found many nurses were not adopting the practice guidelines for malaria case management. Three barriers affected their decision to utilize or not utilize the practice guidelines: 1) ambiguity and multiplicity of the guidelines, 2) health system dysfunctions and 3) the nurses' own considerations (Sarrassat, Lalou, Cisse, & Hesran, 2011). The malaria blood smear test was available at this facility but was used in about one-fifth of cases in which the children were given treatment with antimalarial medication. Additionally, 80% of children with negative malaria blood smears were still treated with antimalarial mediation (Sarrassat et al, 2011).

Another program which was not completely successful in Senegal was the Accelerated Child Survival and Development Program (ACSD), a UNICEF project in 11West African countries from 2001 to 2005. The goal of ACSD was to reduce childhood mortality by 25% prior to 2006 by strengthening existing activities, and included programs to improve coverage of pneumonia interventions. However, a post project evaluation in 3 of the 11 countries did not show a reduction in deaths greater than those of comparative controls (Bryce, Gilroy, Jones, Hazel, Black & Victora, 2010). Although Senegal was not one of the countries actually evaluated, the interventions were similar in all countries and not likely to have different results.

These variable findings suggest the case management for care of children in Senegal may not be consistent with WHO guidelines for the care of children with pneumonia.

Access to health care in Senegal. The immunization rates in Senegal are increasing with 92% of children immunized against diphtheria, pertussis and tetanus (DPT) in 2013 (GAVI, 2014). Unfortunately, the pneumococcal immunization to prevent a common pneumonia pathogen just began distribution in Senegal in 2014 (Global Alliance for Vaccines and Immunizations, 2014). Immunizations are widely accepted in Senegal, with the availability of vaccines limiting coverage.

Access to care issues were found in Senegal were similar to those in other settings. Barriers due to long distances from health services, a lack of transportation, and a lack of financial resources were found, in addition to cultural beliefs which may discourage accessing health care (Ndaiye, Ndir, Hane, Michel, & Bousquet, 2004). According to Ndiaye (2004), many people in Senegal feel the public health care system has inadequacies, and they do not see the services as helpful for people who are ill. A distrust of hospital care could be preventing health seeking behavior by the caretakers of children with pneumonia.

Implications for Nursing

Preventable pediatric mortality continues worldwide, including a significant number of childhood deaths due to pneumonia. The childhood mortality rates are decreasing, but still elevated in Senegal, a developing West African country. Senegal continues to have high childhood mortality due to pneumonia despite improvements in preventive measures and primary care management services. However for pneumonia mortality rates to be reduced to rates similar to developed countries, developing countries such as Senegal will need adequate services on all levels, including appropriate hospital care to reduce the mortality. Although effective, validated case management strategies exist for the treatment of pediatric pneumonia, the guidelines are not being utilized globally and may not be adopted in Senegal. For adoption of the guidelines, health

facilities need to provide medication, supplies, equipment and adequately trained nurses with adequate time to complete assessments and have the how-to knowledge to provide the skilled care recommended by the WHO guidelines for care of hospitalized children with pneumonia.

Although nursing care in hospitals is very important in improving outcomes, there is a scarcity of nursing research, particularly related to hospital practice in developing countries, sub-Saharan Africa or Senegal. Few studies are found from developing countries in which the focus is pediatric nursing care of any disease process. Assessment of WHO guideline adherence by nurses at a first level district hospital in a low resource setting is not currently found in the literature. A literature search did not find information about the delivery of nursing care in Senegal or address whether issues such as nursing shortage, inadequate educational preparation or limited materials affected the delivery of care.

A shortage of health care workers exists in Senegal, however the effect of the shortage on the delivery of care in first level health facilities is not known. Limited financial resources may be problematic for delivery of hospital care, which is more costly than providing care for the children at home or in the community. A lack of funding may also have an impact on the availability of necessary supplies, such as oxygen therapy and nasogastric tube use, and the availability of medications needed by nurses to care for hospitalized children with pneumonia.

Pediatric mortality rates due to pneumonia have been reduced in developed countries and similar reductions in pneumonia mortality may be attained globally if standardized guidelines can be adopted and utilized worldwide. Adoption of validated guidelines to ensure appropriate hospital care is important and needs to be promoted globally. An assessment of guideline adoption is a necessary step to increase understanding of the strengths in guideline use to be

supported, and the identification of barriers which need to be addressed, so that a reduction in pediatric mortality towards the MDG target can be achieved.

Rationale for Study

The use of the WHO recommendations, as internationally recognized standards of care, should be supported in practice settings as a means to decrease pediatric pneumonia mortality and work towards meeting MDG #4 to reduce preventable pediatric deaths. The development of guidelines does not ensure a change in practice, and in fact, delays in transferring findings into practice settings are common in developed countries. Utilizing evidence based research in practice has been a challenge in many hospitals, including those in high resource settings where it often takes several years for changes to be adopted into practice. Less effective care continues to be delivered when improved evidence based strategies could reduce morbidity and mortality. Utilizing global standardized guidelines for nursing practice and health care services have additional challenges due to the nature of nursing and health care delivery, which occurs in isolated individual practice settings (such as hospitals, homes or clinics). Delivery of care may continue to follow traditional practices, without adopting, or possibly being aware of the current recommendations. The knowledge of guidelines is necessary for adoption, yet nurses in developing countries are also less likely to have access to current information. Developing countries may not have the ability to provide government regulation or oversight, which may also contribute to differences in health care delivery and nursing practices.

Patient outcomes are optimized by the delivery of care based on the accepted standards, yet the process of adopting a new practice is a complex phenomenon, involving many factors within multiple levels in order for the changes to be implemented into health care delivery services. Identification of factors which affect adoption of clinical practice guidelines is an

important and necessary first step in the development of appropriate interventions to improve care.

Study Questions

1. Have the WHO recommendations for the hospital care of children with pneumonia been adopted for the delivery of care by nurses in a first level health facility in Senegal?

2. Do barriers exist which hinder the adoption of the WHO guidelines for hospitalized children with pneumonia?

Chapter III. Methodology

This descriptive study utilized data from a survey completed by registered nurses, voluntarily and confidentially, to assess the reported delivery of care for children hospitalized with pneumonia and compare with the WHO recommendations for inpatient care of children with severe pneumonia in a low resource setting.

Study Design

This study collected descriptive data from nurse participants at a first level health facility in Rufisque, Senegal. Data were obtained using a written survey, and findings were compared with the WHO guidelines for the nursing care of hospitalized children with pneumonia to assess for adoption of the guidelines. The study obtained information anonymously from the bedside nurses who have the direct experience of bedside nursing practice in this setting.

The surveys were provided in manila envelopes to the 'Infirmiére en chef' or chief nurse of the pediatric unit, who distributed and collected the surveys from registered nurses. The survey data were assessed using the Diffusion of Innovation framework to examine the adoption of WHO recommendations to evaluate the areas related to knowledge of the guidelines, adequacy of guidelines factors, practice of how-to knowledge and nursing skills confidence. The responses to the open ended question were summarized. Barriers to the utilization of the guidelines were identified.

Purpose of the Study

The purpose of this descriptive study is to assess the reported nursing care of children with pneumonia in a first level health facility in Senegal, West Africa and compare the reported

care to the World Health Organization recommendations. Barriers to guideline utilization were identified and recommendations to improve guideline adherence were developed.

This nursing study also contributes to the current limited global information pertaining to the health facility nursing care of children in Senegal and may be relevant to other developing countries of sub-Saharan Africa.

Another specific intent of this study was to involve current nurses working within district hospitals in a low resource setting as expert sources of nursing care information. Although nurses are in an excellent position to assess the strengths and weaknesses of delivery of care, few studies are found globally in which the bedside nurses contribute to the study process. The sharing of nurses' voices internationally may help promote cultural understanding among nurses worldwide.

Identification of strengths and barriers in the process of adoption of guidelines may be helpful when examining care within other hospital settings, especially related to the care of children and the care of those with pneumonia.

Study Questions

1. Have the WHO recommendations for the hospital care of children with pneumonia been adopted for the delivery of care by nurses in a first level health facility in Senegal?

2. Do barriers exist which hinder the adoption of the WHO guidelines for hospitalized children with pneumonia?

Study Setting

Hospital Youssou M'bargane Diop is a first level health facility located in the district of Rufisque, Senegal. Approximately 300,000 to 500,000 people live in this suburban and rural district which is about 15 miles from the capital city of Dakar and borders the Atlantic Ocean on

the west coast of Senegal. The health facility is located in a semirural area on the outer border of the city of Rufisque and is the only first level general health facility in the district. One pediatrician, the only pediatrician in the district of Rufisque, is employed at the health facility and treats both outpatient and inpatient pediatric patients with the assistance of registered nurses. Patients can be referred for higher levels of care to hospitals in Dakar, located approximately one to two hours driving time from Rufisque. Many residents of Rufisque do not have access to automobile transportation and patients may arrive at Hospital Youssou M'bargane Diop via horse or donkey back, animal led cart, local taxi, automobile or bus and many walk or are carried.

The hospital does not have intensive care capability but does provide inpatient care and limited surgical services. The pediatric area of Hospital Youssou M'bargane Diop is housed in two small one story buildings around a small covered courtyard. There are 2 rooms with a total of 11 inpatient pediatric hospital beds. A pharmacy and limited laboratory services are available within the hospital compound.

Study Sample

The participants are registered nurses who provide direct care for children with pneumonia as part of their employment at Hospital Youssou M'bargane Diop. During a site visit by the researcher in January 2013, four to eight nurses were reported to work in the pediatric area each week. Therefore the projected goal was to obtain completed surveys from 75% of the projected sample size of 4 to 8 nurses. The predicted maximum number of potential participants was thought to be 10. Fourteen surveys were provided to the chief nurses, in case of loss or damage, and eleven completed surveys were returned, for a return rate of 110% of the projected maximum participants. All returned surveys are included in the findings, without exception.

Several individual questions were not answered by some participants, and two participants did not complete the back of the first page of the survey. Each survey item had at least 8 responses.

Procedures

Sample Selection. Participants were registered nurses, recruited by self-selecting, convenience sampling. A stipend of 2,500 CFA (West African Franc) which had an approximate value of 5 US dollars was provided by the researcher to registered nurses completing the survey in compensation for the time necessary for their participation.

The surveys were delivered to the 'infirmiére en chef' or chief nurse, who distributed and collected the surveys over the 5 day period from July 31 through August 4, 2014. The participants completed the written paper survey in French, which was provided in a plain manila envelope.

Protection of Ethical Rights of Participants and Patients. Prior to the collection of data, the project was reviewed by the University of Virginia Institutional Review Board for the Social and Behavioral Sciences (IRBSBS) and determined to be exempt from further review for a four year period. A copy of the IRBSBS exemption letter is found in Appendix G.

The Hospital Youssou M'bargane Diop does not have a research ethics review board. A hospital administrator reviewed the survey and consented to the distribution of the survey to the registered nurses in the pediatric area. The pediatrician and chief nurse also agreed to participation during a meeting at Hospital Youssou M'bargane in January 2013, and again at the time of the study in August 2014.

The participants were asked for confidential responses and the data collected did not include any identifying information. Patient care information was not accessed or utilized in any

form for this study. The collected data were not correlated with any patients or patient outcomes. The study did not involve interventions or patient involvement.

Tool Development. The non-validated survey for this study was developed by the researcher to obtain descriptive information about the delivery of nursing care specifically recommended in the WHO 'Pocket book for hospital care of children' for the care of children with pneumonia. The survey questions were developed to correspond with each of the WHO recommendations related to nursing care for hospitalized children with pneumonia. The survey used both 4 point and 5 point Likert scales in which the participants gave their subjective responses related to their self-reported delivery of nursing care for children with pneumonia and their subjective responses concerning their confidence in their ability to provide care.

The survey format was based on a similar surveys previously utilized to assess adoption of guidelines. A study of nurse practitioners' adherence to the National Asthma Education and Prevention Program guidelines (O'Laughlen, Rance, Rovnyak, Hollen & Cabana, 2013), a study of physician adherence to cystic fibrosis guidelines (Glauser et al, 2012 and a study of physician use of asthma care guidelines (Cabana, Rand, Becher & Rubin, 2001) used a similar format to obtain self-reported data on the adoption of guidelines into practice.

The survey and survey instructions were developed in English and translated into French by a Ph.D. faculty member from the Department of French at the University of Virginia. To ensure correct translation, the survey was translated back to English by a second Ph.D. French professor and was found to be appropriate. The survey in English is found in Appendix C and the survey in French in found in Appendix D. The survey instructions in English are found in Appendix E and the French translation of the survey instructions which were attached to each survey envelope and are found in Appendix F.

Data Management

Survey responses to each Likert question were compiled into an Excel spreadsheet and saved digitally to a digital memory card. Eight of the 11 participants gave written responses to the open ended question. The written responses were translated from French to English by a University of Virginia Ph.D. French department faculty member. The responses were compiled in a Word document which was saved to a digital memory card. The file of collected data will be saved by the researcher on a digital memory stick for 3 years until being destroyed in August 2017. The completed paper surveys will be saved for one year and destroyed in August 2015.

Data Analysis

The small sample size in this study did not provide sufficient data for statistical analysis; therefore only descriptive data are reported. The mean response and range of responses was determined for each Likert style question. The written responses were summarized. The items were then examined by Diffusion of Innovation component to identify strengths and weaknesses in the adoption process. The responses were compared to the recommendations from the WHO guidelines to determine level of adoption.

Rogers' Diffusion of Innovation' theory was used to guide the assessment of three components important to the adoption of guidelines. Knowledge of the guidelines which influence the first step in the adoption process, characteristics of the innovation or guideline factors influence the persuasion or interpretation step of the process, and characteristics of the innovator or people factors, which influence the decision to adopt, were assessed.

To assess the knowledge of the guidelines, the survey asks the nurses whether they were familiar with the WHO 'Pocket book of hospital care for children' guidelines and whether the guidelines are being utilized.

The Diffusion of Innovation component of guideline factors or characteristics of the innovation was assessed by asking about the impact of adequate time and available materials on the ability to delivery care based on the specific recommendations. The guideline factors materials required necessary for the implementation of these guidelines are parenteral antibiotics and supplies for administration, oxygen source and delivery supplies, suction source and supplies, and nasogastric tubes and supplies. The survey questions ask the nurses whether availability of the necessary supplies had an impact on their delivery of nursing care.

The guideline factor of adequate time was assessed by asking whether the availability of adequate time impacted their ability to complete five required nursing tasks: assessment of weight and vital signs, recognition of worsening respiratory distress, administration of antibiotics, delivery of oxygen and measurement of oral and intravenous intake for children.

Two sections of the survey assess characteristics of the innovators or people factors, a section on nursing procedural confidence and a section related to specific how-to knowledge of the recommendations. The nurses were asked about their confidence in their ability to complete the necessary nursing skills, which are the measurement of pediatric vital signs and weight, the administration of oxygen administration of medication, the use of nasogastric tubes and the use of suction equipment. The how-to knowledge as assessed by asking the nurses how frequently they delivered the specific care recommendations from the WHO guidelines.

One open ended, optional question was included in the survey in which participating nurses were able to offer their subjective opinion of what would better help them care for children with pneumonia.

Strength and weaknesses of the design

This study utilizes the expertise of bedside nurses to assess nursing practice, which strengthens the findings. The study design with involvement of nurses also strengthens the validity of this study as nursing research, which is not common in developing countries where nursing research is in early development.

Another strength of this study design is the utilization of internationally accepted guidelines to assess nursing practice, which strengthens the premise of the study

The small sample size is a study limitation and prevents statistical analysis of the findings. The findings are not generalizable to other settings.

The use of self-reported information may be a limitation in the design. Multiple factors can affect reported responses, including those which are only known to the participants. Cultural and language impacts can exist in the study which not known to the researcher.

In addition, the provision of a stipend may have encouraged the participation of nurses for the monetary incentive and their responses may not have been reflective of their actual practice.

Nursing Practice Implications

The literature review indicated the importance of nursing practice consistent with the WHO guidelines for the care of hospitalized children with pneumonia. Determining whether the nurses are practicing consistent with the guidelines will help to understand the strengths to be supported, and the barriers which need to be addressed so that children will have access to effective care and potentially reduced mortality.

Expected utilization of data. Research findings and analysis were used to write a manuscript to fulfill the requirements for the Capstone project and a manuscript to be submitted to the International Nursing Review for potential publication.

Chapter IV. Results

This study aimed to answer two study questions for this investigation:

1. Have the WHO recommendations for the hospital care of children with pneumonia been adopted for the delivery of care by nurses in a first level health facility in Senegal?

2. Do barriers exist which hinder the adoption of the WHO guidelines for hospitalized children with pneumonia?

Survey components

The survey contains 39 Likert scale questions and one open ended question pertaining to three components of the 'Diffusion of Innovation' framework: characteristics of the innovation, characteristics of the innovators and knowledge of the innovation (Rogers, 2003). Two areas of the characteristics of the innovation (or guideline factors) were examined, the availability of time and the availability of supplies and equipment. The first guideline factor, the availability of adequate nursing time to complete the tasks is a correlate to adequate nurse staffing. Without adequate nurse staffing, the available time for the delivery of care will not allow for the care to be consistent with the recommendations. The second factor, the availability of supplies, medication and equipment, is an indicator of the ability of the facility to provide the necessary materials. The guideline factors influence the persuasion or interpretation stage of adopting an innovation. In this situation, the accessibility or inaccessibility of supplies and adequate time may affect the nurses sense of whether following the recommendations is feasible, which would persuade them to move towards or away from a decided to adopt the recommendations.

The two areas related to characteristics of the innovators (or people factors) studied were: nursing procedural confidence and how-to knowledge. The adopters' preparedness and knowledge of following the guidelines influence the decision step of adopting the guidelines.

Nursing confidence is assessed related to skills generally taught in basic nursing education and a lack of confidence in these skills would suggest inadequate nursing educational preparation. Inadequate nursing preparation would be a barrier to the adoption of the guidelines. How-to knowledge relates to specific practice recommendations which are not part of basic nursing education, and suggests appropriate continuing education has been available to guide nursing practice. This section addresses the question of whether the guidelines have been adopted.

The third component queried in the survey relates to the first step in the adoption process, knowledge of the guidelines. This section relates to both study questions by direct questioning of the adoption of the guidelines and identifying whether a lack of knowledge of the guidelines exists, which would be a barrier to the adoption.

The survey questions pertaining to each 'Diffusion of Innovation' component are contained in Table 1.

Rate of responses

During the researchers January 2013 site visit, the estimated number of nurses working weekly in the pediatric area was stated as 4 to8 nurses and therefore the goal was to have 75% return of completed surveys from the nursing staff, or 3 to 6 responses at minimum and estimated maximum of 10 completed surveys. Fourteen surveys were provided to the chief nurse to avoid missing participants due to the paper surveys being lost or destroyed, and 11 nurses completed surveys, for a response rate of 110% of predicted maximum.

The participant instructions on the front of the envelope included the recommendation the participants should not answer any questions which they did not feel comfortable giving an answer. (Appendix E for survey instructions in English and Appendix F for survey instructions in French). Twelve individual questions were not answered, one time for each question, and in

addition, 2 participants did not complete the back of the first page of the survey, which contained 13 questions. In total, 38 individual responses were missing from the 429 potential responses of the 11 participants. The participants provided responses to 91% potential questions. Twenty-one questions, 60 % of the survey, were answered by all 11 participants. The minimum number for any question was 8 responses, which was received on 2 questions. Sixteen questions received 9 or 10 responses.

The first section of the survey contains 17 questions which query the nurses self-reported practice of specific how-to knowledge recommended for the care of children with pneumonia, and 2 questions ask about the nurses' awareness and use of the WHO 'Pocket book for hospital care of children' recommendations. Responses to the first 19 questions are tabulated in Table 2. The second part of the survey contains 5 sections which assess the reported impacts of time and supplies on the ability of the nurses to complete the procedures, and the sixth section relates to the nurses' confidence in performing the procedures. Of the 20 total questions in this section, 4 questions had 10 responses and 16 questions were answered by each participant for11 responses. Table 3 contains the tabulation of responses to these 6 survey sections.

Thirty four survey Likert question responses and the written responses to the open ended question are included in the analysis. The mean responses and range of responses are reported for each question used in the study. One question was found to be potentially ambiguous. The question related to the impact of proper training on the ability to perform the procedures and was found to have erratic answers. When re-examined, the question was not clear about where proper training would be received. The question related to each of the 5 procedures studied, and the responses to these 5 questions were not included in the analysis.

Eight participants added hand written responses to the opened ended question. The translations were verified by a Ph.D. faculty member of the French department at the University of Virginia.

Findings

Assessment of guideline adoption. **People factor, how-to knowledge.** The first people factor examined was the nurses' how-to knowledge of the individual recommendations in the guidelines, which assesses whether the guidelines have been implemented in practice. How-to knowledge was assessed by the reported frequency of specific nursing care recommendations. The nurses were asked to report their frequency of practice for 17 recommendations, with potential responses based on a five point Likert scale using "never" (0%), "rarely" (less than 25% of the time), "sometimes" (25-50% of the time), "often" (50-75% of the time) and "usually" (over 75% of the time). The how-to knowledge was assessed in three areas: antibiotic administration, oxygen delivery and nursing assessment.

How-to knowledge: antibiotic administration. Four questions related to the how-to knowledge for administration of antibiotics. The nurses were asked if they delivered antibiotics at the correct time, as directed in the guidelines. The mean response indicated antibiotics are "usually", over 75% of the time, delivered on time. The range of responses included one response indicating the delivery of antibiotics on time was "often" practiced, and 10 responses reporting the antibiotics are "usually" delivered on time. Three questions were related to specific routes of medication administration. The guidelines recommend antibiotics be given by the intravenous or intramuscular route for children with a diagnosis of severe or very severe pneumonia. The mean response indicated the nurses "usually", over 75% of the time, deliver antibiotics parentally for these children, with the range of 3 responses of "often", and 8 responses

of “usually”. For the administration of intramuscular antibiotics, the WHO guidelines recommend the nurses choose specific sites for intramuscular injections based on the age of the child. The mean response indicated the injections are “usually” given appropriately given in the lateral thigh for children under 2 years of age, with 9 responses indicating “usually”, and one response of “often”. For children over 2 years of age, the guidelines recommend intramuscular injections are given only in the upper outer buttocks and the mean response indicates the nurses “often” choose this injection site in this age group, although one nurse indicated” never” using this site and 2 nurses indicated they “sometimes” give injection in the upper outer buttocks in children over 2 years of age (Figure 5).

How-to knowledge: oxygen delivery. The how-to knowledge related to the delivery of oxygen was examined in 4 questions. Oxygen administration is recommended for all children with very severe pneumonia or respiratory distress and the mean response reported the nurses’ practice is “usually”, over 75% of the time, delivery oxygen to children with severe pneumonia or respiratory distress. One nurse reported oxygen delivery is “often” given in this situation. The guidelines also specify when delivering oxygen, the oxygen system should be checked every three hours to ensure the device is in place, the tubing is connected and the system is functioning. The mean response indicated the nurses’ “usually” complete this task, with a range of responses from one response of “sometimes” to “usually”. The guidelines recommend the children with severe or very severe pneumonia have oxygen saturation measurements obtained at the time of hospital admission. The mean response indicates the nurses’ practice “usually” includes this oxygen saturation measurement on admission, however 2 nurses reported they “never” measure oxygen saturation, and 3 nurses report they “often” complete this task. When oxygen saturation measurement is not available, the recommended practice is to deliver oxygen until the child’s

breathing rate is less than 70 per minute and chest indrawing is resolved. The nurses' mean response reports they "often" deliver nursing care according to this recommendation. Two nurses responded they" never" follow this recommendation and 2 nurses responded they "sometimes" follow this practice. Four nurses reported they "often" deliver oxygen until the child's breathing rate is less than 70 per minute, and one nurse reported "usually" delivering oxygen until the child's breathing rate is less than 70 per minute and chest indrawing is resolved (Figure 6).

How-to knowledge: nursing assessment. Nursing assessment practices are an important area of how-to knowledge necessary for adoption of the guidelines for the care of children with pneumonia. All 11 nurses reported they "usually" maintain a written record for each child and include documentation of each assessment with measurement of heart rate, respiratory rate and temperature. All of the participants also indicated the child's weight is "usually" measured on admission. The documentation of level of consciousness and ability to take oral fluids with each assessment was reported as "usually" done by 6 nurses and "often" done by 3 nurses. The recommendations for nursing assessments to be completed at least every 6 hours for children with severe pneumonia and at least every 3 hours for children with very severe pneumonia where both reported by mean response as "usually" completed, with a range of "sometimes" to "usually" responses. The single assessment parameter reported by mean response to be practiced "often", which is less frequently than the other parameters, was the practice of recording daily intake of the child's drinking, eating and breastfeeding. The range of responses was from "never" to "usually" recorded (Figure 7).

How-to knowledge: suctioning and administration of nasogastric fluids. Two how-to knowledge areas also assessed were the use of suction and use of nasogastric feedings. The guidelines for the care of hospitalized children with pneumonia recommend suction should be

utilized to clear secretions when the child cannot clear their own airway. Ten nurses reported their practice was "usually" completing this task with one nurse reporting often using suction in practice if the child needs secretion removal. The administration of liquids and medications via nasogastric tube is recommended when children with pneumonia are unable to take them orally. The mean response indicated this is "usually" completed with 5 nurses reported they "usually" complete this task and 4 nurses reporting they "often" complete this task (Figure 8).

How-to knowledge: general findings. The second people factor studied, how-to knowledge, found of the 15 specific recommendations of the guidelines, 11 were reported to be "usually" practiced, over 75% of the time, and 4 were "often", 50-75% of the time. Of the four recommendations with mean responses of "often", two questions were related to oxygen delivery and the responses could have been affected by the availability of supplies. The recommendation with mean responses of "often" were whether oxygen saturation was checked on admission and whether oxygen was delivered until the respiratory rate was less than 70 per minute and the distress was resolved.

The third question with a mean of "often" practiced was the how-to knowledge about choice of site for IM injections in children over 2 years of age, which is a nursing choice. The fourth question asked if a daily record of intake was maintained, which again is nursing decision, which could be affected by time constraints.

None of the mean responses for the practice of how-to knowledge were found to be "never", "rarely" or "sometimes" practiced; all of the recommendations were reported to be practiced "often", 50-7% of the time, or "usually", over 75% of the time.

Assessment of guideline adoption: guideline awareness. The third component of the Diffusion of Innovation framework examined was the awareness of the guidelines. The first

question asked the nurses of they were familiar with the WHO pneumonia guidelines. The mean response indicated the nurses are “often” aware of the guidelines, with a range of “rarely” to “usually” aware. A second question asked if the guidelines for the care of children with pneumonia in the ‘Pocket book of hospital care for children’ related to the care of children with pneumonia were being followed. The mean response was “sometimes” with the responses ranging from “rarely” to “usually” (Figure 9). During the August 2014 site visit, the pediatrician reported the hospital unit does not have a copy of the WHO ‘Pocket book for care for hospitalized children’, but she receives education based on the WHO guidelines through the Senegalese Ministry of Health. The physician shares information with the nursing staff.

Identification of barriers: guideline factor, adequacy of resources. Using the Diffusion of Innovation framework, the first components examined were the characteristics of the innovation, or guideline factors, which assesses for barriers to adoption of the guidelines.

Availability of adequate nursing time. The adequacy of nursing time was assessed through the report of the nurses on how significantly having enough time available affected their ability to complete five recommended tasks. The tasks studied are completion of nursing assessment with vital signs, administration of antibiotics, delivery of oxygen, and administration of nasogastric fluids and suctioning of secretions. The potential survey responses were: “impact not significant”, “slightly significant”, “moderately significant” or “extremely significant” impact.

For each of the five tasks, the nurses mean response indicated that having enough time available has a “moderately significant” effect on their ability to complete the tasks. The range of responses was from one response of “not significant”, to “extremely significant” (Figure 2).

***Availability of materials*.** The second guideline factor examined was the significance of the availability of necessary supplies, medications and equipment on the ability to complete the same nursing care procedures as above. The mean response indicated the availability of equipment for the administration of oxygen and the suctioning of secretions had an "extremely significant" impact on the ability to complete these two tasks. All of the individual responses for the administration of oxygen were either "moderately" or "extremely significant" effect. The range of responses for suctioning was from "no significant" effect to "extremely significant" effect. It was noted during the August 2014 site visit that only one of the two oxygen concentrators, the source of supplemental oxygen in the pediatric unit, was functional, which could significantly limit the capacity of the nurses to provide care as directed by the guidelines.

The availability of a scale and thermometer for completing a nursing assessment, the supplies for administration of antibiotics, and the supplies for delivery of nasogastric feedings were each noted to have a mean response of "moderately significant" effect on the delivery of care. The responses ranged from "not significant" to "extremely significant" effect (Figure 3).

Identification of barriers: people factor, nursing confidence. The second characteristics of the innovators, or people factor, is nursing procedural confidence which was assessed through self-report of the nurses' confidence in completing procedures which would be taught in a basic nursing educational preparation. Inadequate nursing preparation would be a barrier to the adoption of the guidelines.

Confidence in nursing skills. The skills examined were measurement of vital signs and weight, the ability to recognize worsening signs of respiratory distress, the measurement of oral and intravenous intake in children, and the administration of antibiotics. The potential responses were: "not at all confident", "somewhat confident", "moderately confident" and "very confident"

in performing these tasks. The mean response for each level task indicated they feel “very confident” in their ability to perform the required nursing skills. Each of the 11 participants reported feeling “very confident” in their ability to measure vital signs and weight for children. The responses ranged from “moderately confident” to “very confident” for the other four items (Figure 4).

The mean responses to each survey question are found in Table 4.

Individual written comments. Eight nurses gave written responses to the open ended question ‘What would help me better care for children with pneumonia?’ Two themes were identified from the responses. The most frequent recommendation, written by 7 of the 8 nurses, was that they needed continuing education to help them better care for children with pneumonia. The second theme, mentioned by 5 nurses, was the need for adequate equipment and supplies. The need for adequate medications was also mentioned and one nurse felt a better hospital building would also be beneficial. The 8 responses in English translation are listed in Table 5.

Chapter V. Discussion

This study found the WHO guidelines have been adopted in practice, however two barriers were identified which could affect implementation: the shortage of materials and inadequate nursing time.

Adoption of the WHO guidelines

The first study question 'Have the WHO recommendations for the hospital care of children with pneumonia been adopted for the delivery of care by nurses in a first level health facility in Senegal?' is answered in two survey components, the how-to knowledge and knowledge of the guidelines.

People factors: How-to knowledge analysis. The findings in the how-to knowledge area found the reported nursing practice at Hospital Youssou M'bargane Diop is consistent with the WHO guidelines. Sixteen specific recommendations were assessed in the areas of oxygen delivery, antibiotic administration, nursing assessment and additional care. Twelve recommendations or 75%, had a mean response of "usually" (over 75% of the time) practiced and 4 recommendations or 25%, had a mean response of "often" (50-75% of the time) being practiced. None of the recommendations were reported as being practiced "sometimes" or "rarely". Of the four recommendations in which the mean response was "often", two involved oxygen delivery and may be also be affected by inadequate supplies. It is possible the nurses intend to provide oxygen until the child's respiratory rate was under 70 per minute and distress has resolved, but with one oxygen concentrator available, they may need to make decisions about how to best utilize the resources available. The measurement of oxygen saturation on admission was reported as obtained "sometimes", which could also be affected by the availability of oximetry. The third recommendation reported as "sometimes" practiced was the administration

of intramuscular injections in the buttocks for children over 2 years of age. This is a nursing decision and not affected by availability of supplies. The fourth recommendation with a mean response of "sometimes" was the recording of the daily intake of oral and intravenous fluids for each child. This is also a nursing decision; however this practice may be affected by time constraints. Maintaining a record of intake is important in the care of children with pneumonia who are at high risk for dehydration and not recognizing decreased intake could lead to negative outcomes, which should be averted with attention to nursing assessment. Therefore, strengthening the practice of this recommendation could have a positive impact on patient outcomes.

Knowledge of the guidelines analysis. The guideline awareness component of the Diffusion of Innovation framework also supports the conclusion that the guidelines have been adopted. The nurses mean responses indicated they "often" are aware of the guidelines and the guidelines are "sometimes" followed in the delivery of care. From the how-to knowledge, the reported practice is consistent with the recommendations, indicating knowledge of appropriate practice, although the practice may not be recognized as part of the WHO guidelines. At the times of the site visit, the staff did not have the 'Pocket book of hospital care for children' available, but reported receiving WHO based educational information from the Senegalese Ministry of Health. In addition, the responses to the open ended question found the majority of the participants feel the care of children with pneumonia could be improved with continuing education. This suggests the nurses may be concerned that the care delivered does not follow the WHO guidelines, which is not consistent with the survey findings indicating the nursing practice does follow the WHO recommendations.

The implementation of the guidelines suggests most nurses have received appropriate education and have the knowledge necessary to delivery care according to the recommendations. This is contradictory to the findings from other sub-Saharan African hospitals where the staffs were reported to have significant knowledge deficiencies (Nolan et al, 2001; Baker, 2009).

Identification of barriers

The second study question, 'Do barriers exist which hinder the adoption of the WHO guidelines for hospitalized children with pneumonia?' is answered in the survey sections on characteristics of the innovation or guideline factors, and the characteristics of the innovators, or people factors in the section related to nursing procedural confidence.

Guideline factors: adequacy of supplies analysis. All of the 5 tasks studied were at least moderately impacted by the availability of supplies, which indicates barriers to the delivery of appropriate care could exist. The availability of supplies to administer oxygen and suction secretions were both reported to have an "extremely significant" effect on the ability to provide these treatments for children with pneumonia. During the August 2014 site visit, supplemental oxygen for the pediatric area was provided by oxygen concentrators, however only one of the two concentrators was functional. The limited ability to administer oxygen, which can be life-saving for children with pneumonia, is a significant issue. The capacity to treat one child with oxygen at a time would result in suboptimal care for additional ill children and could lead to negative outcomes. In addition, oxygen concentrators require electricity and it is not known if oxygen can be delivered during power outages, which can occur frequently in this area.

Another equipment concern noted at the January 2013 site visit was the hospital x-ray machine was not functional and chest x-ray findings were not available. The WHO guidelines do not recommend chest x-rays for initial care but are suggested, if available, to assess for

pneumonia complications, such as pleural effusion and empyema, or assess for tuberculosis in children who are not improving after 48 hours of therapy. In August 2014, the hospital was still unable to obtain chest x-ray results on site, but the staff reported they had developed a process to obtain chest x-ray films if indicated. The caretakers have the option to take the child to another facility, approximately 20 miles away, where they receive the completed x-ray films to bring back to Hospital Youssou M'bargane Diop. The caretakers are responsible for the x-ray fees and the transportation of the child, which could prevent families from being able to utilize this option.

In August of 2014, the availability of medications had improved from the site visit of January 2013. The supplies for medication administration are provided by the hospital but the caretaker is responsible for purchasing the medications, including parental antibiotics, from the hospital pharmacy and delivering the medication to the nurses for administration. During the site visit in August 2014, the medications were available for pediatric patients at a reduced rate (or free of charge if the family was unable to pay) as a result of a charity donation provided by the CBAO bank (Compagnie bancaire de l'Afrique occidentale or Banking Company of West Africa) in December of 2013. The bank provided 5 million CFA (about $10,000) worth of medications purchased at wholesale rates which allows for the sale of medications to patients at the reduced rates.

Previous studies in sub-Saharan African hospitals found serious shortages of materials. Shortages of equipment and supplies at Hospital Youssou M'bargane Diop are not universal, however the greatest impacts were found related to the ability to deliver oxygen and suction secretions which are significant and potentially life-saving treatment recommendations for the

care of children with pneumonia. Ensuring adequate materials should be a high priority, necessary to practice in accordance with the WHO guidelines and prevent negative outcomes.

Guideline factors: adequate nursing time. The mean responses indicated the availability of adequate time has moderately significant effect on ability to complete each of the queried nursing procedures, indicating this may be a potential barrier to completing the appropriate care. However, the majority of the recommendations are reported as usually delivered, which suggests the nursing staff has been able to manage within the available time constraints. This raises the concern that nursing time is barely adequate or is inconsistent, which could be a potential source of stress for the nursing staff. It is also a concern that the staff may not be able to complete the appropriate care during times of high census or high acuity, which could result in poor patient outcomes. An analysis of the nursing workload and nursing hours would be needed to determine if the current nursing hours are adequate. A nursing shortage exists in Senegal and there may be a limited number of registered nurses in the Rufisque district, preventing the hospital from hiring more nurses. Further study would be needed determine the impact of nursing shortages in the area.

People factors: nursing procedural confidence. The mean responses indicate the nursing staff feels "extremely confident" in their ability to complete the 5 nursing skills. This suggests they have been adequately prepared, likely in their basic nursing education, to feel confident in completing these skills, which are universal nursing practices and not specific to the guidelines for the care of children with pneumonia.

Again, the nursing knowledge deficiencies noted in the literature review are not found in this setting, and a negative impact from inadequate knowledge is not expected. On the contrary, the two people factors studied, the nursing procedural confidence and how-to knowledge, were

both found to be strengths in the adoption of the WHO guidelines. The strength in people factors supports the important role of nurses in delivering care consistent with the guidelines.

Study strengths and weaknesses

The utilization of the on-site nursing voice and expertise to assess the delivery of care is a strength of this study. Involving the nursing staff to provide information directly related to bedside practice provides a view rarely found in international research. Few studies in developing countries are found which focus on nursing care. This study may encourage further nursing inquiry in low resource settings.

Another strength of this project was the use of Roger's 'Diffusion of Innovation' theory as a framework to identify components in the adoption process for assessment. Using this framework, the two potential barriers were found in the guideline factor component, which could affect the ability of the nurses to comply with the guidelines despite having the appropriate knowledge. The 'Diffusion of Innovation' organizational plan points out that the guidelines cannot be fully implemented without the necessary guideline factors which stresses the importance of providing adequate materials and staffing.

The information from this study may increase the knowledge of hospital nursing care and guideline compliance in developing countries, which could be helpful information in other settings.

The higher than anticipated participation strengthens the results of the study. The sample size remains too small to provide data for statistical analysis. Most first level health facilities in developing countries have a relatively small staff; therefore a study to include several facilities may generate statistical data, which could be generalizable. The sample may not be representative of the entire nursing staff within the hospital, or of hospitals or staff in other

Senegalese or sub-Saharan African hospitals and is therefore not generalizable beyond this research setting.

This study utilizes reported nursing data related to nurse's ability to provide care, which is not a direct observation of actual clinical care. Differences in the reported and actual care may exist which could affect the conclusions of this study. A clinical study of care delivery through observation or record review would provide more detailed information about the actual care of children at Hospital Youssou M'bargane Diop. A study of patient outcomes would be helpful to correlate nursing practice with patient outcomes. This study related to one disease process and the findings may be different for care of other illnesses. Further study related to other disease processes would improve understanding of the strengths and needs for the care of all children at Hospital Youssou M'bargane Diop.

The self-selection of participants may have influenced the results. Nurses who volunteered for the study may have individual reasons for choosing to participate, which may alter the responses both positively and negatively. The stipend may have influenced the decision of nurses not interested in the study to participate for the monetary incentive. Although the survey responses were obtained anonymously, the nurses may have been influenced by factors unknown to the researcher or have positive or negative personal views which influenced their responses. For example they may wish to provide socially desirable results or may wish to conceal negative results in order to avoid possible retribution.

Another potential limitation may be influence from unknown cultural impacts which can affect cross cultural research. Language translations may interfere with perceptions and results. In addition, intercultural and cross language research may be affected by unknown misunderstandings, cultural bias or interpretation differences.

Nursing practice implications

This study has implications for nursing in five areas: nursing support, nursing research, reducing barriers, knowledge of guidelines and improving access to services.

Nursing support. Confirming the utilization of the WHO recommendations is a significant finding, which supports the efforts of the hospital team in providing care of ill children. The finding of compliance with the guidelines may reassure the nursing staff, who reported a need for continuing education to improve pediatric care. They may not be aware the care they provide is consistent with the WHO guidelines. The recognition of their strong role in providing guideline consistent care may encourage them to continue providing appropriate nursing care.

Nursing research. In Senegal, as in other developing countries, nursing research is in the early stages of development and completion of this study may encourage both Senegalese and international nurses to promote nursing research. International nursing communication and support is possible across language and cultural differences, resulting in a beneficial exchange of nursing knowledge. This study also suggests implementation of the WHO recommendations in low resource settings can be supported through international nursing research.

Reducing barriers. The potential barriers to guideline adoption were found in the characteristics of the innovation, or guideline factors component. Both the adequacy of nursing time and availability of materials directly affect the nurses' ability to deliver care and maintaining resources should be a high priority. An investigation of the pediatric units' relative needs would help to determine the appropriate levels for supplies and staffing. Examining current practices for procuring and maintaining supplies is recommended, and adjustments made as needed to ensure a process is in place to maintain adequate materials and provide adequate

staffing. Funding options may need to be explored. Seeking nursing input into the development of solutions is valuable and should be encouraged

Knowledge of guidelines. Knowledge of the WHO guidelines may be strengthened by the availability of the WHO 'Pocket book of hospital care for children' in French on the pediatric unit. In addition, the feasibility of the developing a continuing education program could be discussed. An educational review of all disease process guidelines may be beneficial in reinforcing the recommended nursing practice.

Improving access to services. Children with pneumonia being treated at Hospital Youssou M'bargane Diop should be benefitting from the care delivered with improved outcomes and decreased mortality, as found in other sites utilizing the WHO guidelines. The most important treatment for the care of children with pneumonia, the administration of antibiotics, was not reported to be negatively affected by shortages or significant knowledge deficiencies. Identifying facilities where appropriate care is being delivered may have a positive community effect by encouraging more people to seek health care services for ill children. Hopefully, caretakers may also choose to seek health care services sooner, rather than seeking care as a last resort, if they are aware the service is consistent with most effective treatment recommendations for low resource settings. Nursing staff could be influential in teaching the caretakers and general community about the availability of appropriate care at the hospital, which could potentially result in lower pediatric pneumonia mortality in the district.

Implications for further study

These issues found in this study have been found to impact the delivery of care in other first level health facilities, and therefore investigation of implementation strategies from similar

settings may be helpful to address these issues at this site. Table 6 contains a complete list of the study recommendations.

The pediatric nurses at Hospital Youssou M'bargane Diop report the delivery of care for children with pneumonia to be consistent with the recommendations in the WHO 'Pocket book for hospital care of children', however care delivery may be negatively impacted by supply and equipment issues, and time constraints. The nurses appear to be strong and motivated team members, unlike the staff sometimes described in other settings as uninterested and unprepared. They are seeking more information to improve the care of children and they recognize the need for adequate supplies in order to care for ill children. The request for further education and their participation in this nursing study demonstrates professionalism, which is commendable. Nurses are extremely important in the quest to decrease pediatric mortality.

Although intercultural and cross language interactions bring additional challenges, the study of nursing care in developing countries is an important step in supporting nurses and improving hospital care in low-resource settings.

Products of the capstone

The findings from this project were used to write a manuscript for submission to the International Nursing Review for potential publication (see Appendix B).

References

Asgha, R., Banajeh, S., Egas, J., Hibberd, P., Iqbal, I., & Katep-Bwalya, M. (2008). Chloramphenicol versus ampicillin plus gentamicin for community acquired very severe pneumonia among children aged 2-59 months in low resource settings: multicentre randomized controlled trial (SPEAR study). *British Medical Journal*, 336, 80–4.

Armstrong, Schellenberg, J., Adam, T., Mshinda, H. Masanja, H., Kabadi, G., Mukasa, O., John, T., Charles, S., Nathan, R., Wilczynska, K., Mgallula, L., Mbuya, C., Mswia, R., Manzi, F., de Savigny, D., Schellenberg, D., & Victoria, C. (2004). Effectiveness and cost of facility-based Integrated Management of Childhood Illness (IMCI) in Tanzania. *Lancet,* 364(9445), 1583-94.

Baker, T. (2009). Critical care in low income countries. *Tropical medicine and international health,* 14(2), 143-148.

Berman, S., & McIntosh, K. (1985). Selective primary health care: Strategies for control of disease in the developing world. XXI. Acute respiratory infections. *Reviews of Infectious Diseases, 7*(5), 674-691.

Bryce, J., Gilroy, K., Jones, G., Hazel, E., Black, R., & Victora, C. (2010).The accelerated child survival and development programme in west Africa: a retrospective evaluation. *Lancet,* 375(9714), 572-82.

Cabana, M., Rand, C., Becher, O. & Rubin, H. (2001). Reasons for pediatrician nonadherence to asthma guidelines. *Archives of Pediatric and Adolescent Medicine,* 155, 1057-1062.

Camara, B., Diouf, S., Faye, P., Ba, A., Ba, M., Sow, D. & Kuakuvi, N. (2005). [Morbidity and

mortality in a pediatric hospital in Dakar]. [Article in French]. Archives of Pediatrics, 12 (12), 1777-1778.

Camera, B., Diagne-Gueye, N., Faye, P., Fall, M., Ndiaye, J., Ba, M., & Sow, H. (2007). [Malaria severity criteria and prognostic factors among children in Dakar] [Article in French]. *Médicines et Maladies Infectiesus*, 41(2) 63-7.

Catto, A., Zgaga, L., Theodoratou, E., Huda, T., Nair, H., Arifeen, S., Rudan, I., Duke, T. & Campbell, H. (2011). An evaluation of oxygen systems for treatment of childhood pneumonia. *BMC Public Health,* 11 supplement 3:S28.

Central Intelligence Agency [CIA], *World Fact Book: Senegal*. Last modified Feb 05 2013. Accessed March 19, 2013. https://www.cia.gov/library/publications/the-world-factbook/geos/sg.html

Chowdhury, E. K., El Arifeen, S., Rahman, M., Hoque, D. E., Hossain, M. A., Begum, K., Siddik, A., Begum, N., Rahman, Q. S., Akter, T., Haque, T. M., Al-Helal, Z. M., Baqui, A. H., Bryce, J., & Black, R. E. (2008). Care at first-level facilities for children with severe pneumonia in Bangladesh: A cohort study. *Lancet*, 372(9641), 822-830.

Dawson, P., Pradham, Y., Karki, S., Poudel, D., & Hodgins, S. (2008). From research to national expansion: 20 years' experience of community-based management of childhood pneumonia in Nepal. *Bulletin of the World Health Organization*, 86(5), 339-43.

Dieng, I. (1974) Evolution of the nursing profession in Senegal. *International Nursing Review*, 21(6), 172-3.

Duke, T., Wandi, F., Jonathan, M., Matai, S., Kaupa, M., Saavu, M., Subhi, R., & Peel, D. (2008). Improved oxygen systems for childhood pneumonia: a multihospital effectiveness study in Papua New Guinea. *Lancet,* 372 (9646), 11328-33.

Duke, T., Keshishian, E., Kuttumuratova, A., Ostergren, M., Ryumina, I., Stasii, E., Weber, M. & Tamburlini, G. (2006). Quality of hospital car for children in Kazakhstan, Republic of Moldova, and Russia: systematic observational assessment. *Lancet*, 367(9514):919-25.

Enarson, P, Gie, E., Enarson, D. & Mwansambol, A. (2009). Development and implementation of a national programme for the management of severe and very severe pneumonia in children in Malawi. *PLoS Medicine*, 6(11).

English M., Esamai F., Wasunna A., Were F., Ogutu B., Wamae A., Snow, R., & Peshu, N. (2004). Delivery of health care at the first-referral level in Kenya. *Lancet* 364, 1622-1629.

Eshave, P., Bille, J., Audet, C., Talla, I., Vaudaus, B. & Gehri, M. (2003). Percentage, bacterial etiology and antibiotics susceptibility of acute respiratory infection and pneumonia among children in rural Senegal. *Journal of Tropical Pediatrics*, 49(2), 28-32.

Foley, E. (2010). Your pocket is what cures you: The politics of health in Senegal. Rutgers University Press, New Brunswick, New Jersey.

Global Alliance for Vaccines and Immunizations [GAVI] (2014). Accessed November 20, 2014 http://www.gavi.org/country/senegal/

Glauser, T., Nevins, P., Williamson, J., Abdolreaulnia, M., Salinas, G., Zhang, J., Debonnett, L. & Riekert, K. (2012). Adherence to the 2007 cystic fibrosis pulmonary guidelines: A national survey of CF care centers. *Pediatric Pulmonology*, 47, 434-440.

Greenwood, B., Weber, M., & Mulholland, K. (2007). Childhood pneumonia: preventing the world's biggest killer of children. *Bulletin of the World Health Organization*, 85(7), 502-503.

Harrison, M., Legare, F., Graham, I., & Fervers, B. (2010). Adapting clinical practice guidelines

to local context and assessing barriers to their use. *Canadian Medical Association Journal*, 182(2), e78-84. doi: 10.1503/cmaj.081232.

Hildenwall, H., Nantanda, R., Tumwine, J., Petzold, M., Parivo, G., Tomson, G. & Peterson, S. 2009. Care-seeking in the development of severe community acquired pneumonia in Ugandan children. *Annuals of Tropical Paediatrics*, 29(4), 281-289.

International vaccine access center [IVAC], 2012. Pneumonia Progress Report 2012. Johns Hopkins Bloomburg School of Public Health Report, http://www.jhsph.edu/research/centers-and-institutes/ivac/resources/IVAC-Pneumonia-Progress-Report-2012.pdf, accessed June 26, 2014.

Jones, G., Steketee, R., Black, R., Bhutta, Z., &Morris, S. (2003). How many child deaths can we prevent this year? *Lancet, 362*(9377), 65-71.

Kabra, S. K., Lodha, R., & Pandey, R. M. (2006). Antibiotics for community acquired pneumonia in children. *Cochrane Database of Systematic Reviews.*

Kallander, K., Hildenwall, H., Walesa, P., Galiwango, E., Peterson, S. & Pariyo, G. (2008). Delayed care seeking for fatal pneumonia in children aged under five years in Uganda: a case-series study. *Bulletin of the World Health Organization*, 86(5), 332-8.

Kundi, M., Anjum, M., Mull, D., & Mull, J. (1993). Maternal perceptions of pneumonia and pneumonia signs in Pakistani children. *Social science and medicine,* 37(5), 649-60.

Kuti, B., Adegoke, S., Ebruke, B., Howie, S., Oyelami, O. & Ota, M. (2013). Determinants of oxygen therapy in childhood pneumonia in a resource-constrained region. *ISRN Paediatric (International Scholarly Research Network),* doi: 10.1155/2013/435976.

McIntosh, K. (2002) Community-acquired pneumonia in children. *New England Journal of Medicine*, 346(6), 429-37.

Molyneux, E. (2009). Emergency Care for children in resource-constrained countries. *Transactions of the Royal Society of Tropical Medicine and Hygiene,* 103(1), 11-5.

Mulholland, E. K., Simoes, E. A., Costales, M. O., McGrath, E. J., Manalac, E. M., & Gove, S. (1992). Standardized diagnosis of pneumonia in developing countries. *Pediatric Infectious Disease Journal, 11*(2), 77-81.

Mulholland, K. (2007). Childhood pneumonia mortality- a permanent global emergency. *Lancet,* 70(983), 285-9.

Mwangi, R., Chandler, C., Nasuwa, F., Mbakilwa, H., Poulson, A., Bygbjerg, I. & Reyburn, H. (2008). Perceptions of mothers and hospital staff of paediatric care in 13 public hospitals in northern Tanzania. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 102(8), 805-10.

Nolan, T., Angos, P., Cunha, A.., Muhe, L., Qazi, S., Simoes, E., Tamburlini, G., Weber, M. & Pierce, N. (2001). Quality of hospital care for seriously ill children in less-developed countries. *Lancet*, 357(9250), 106-10.

Ndiaye, M., Ndir, M., Hane, A., Michel, F. B., & Bousquet, J. (2004). [Application of the WHO chronic Respiratory diseases programme in sub-Saharan Africa: Problems in Senegal]. [Article in French]. *Revue Des Maladies Respiratoires*, 21(3 Pt 1), 479-491.

O'Laughlen, M. (2010). Improving asthma care for African American children by increasing national asthma guideline adherence. *Journal of Pediatric Health Care,* 25(4), 235-49.

O'Laughlen, M., Rance, K., Rovnyak, V., Hollen, P., & Cabana, M. (2013). National Asthma Education Prevention Program: survey of nurse practitioners' knowledge, attitudes, and behaviors. *Journal of Pediatric Health Care*, 27(2), e17-24.

Powell-Jackson, T., Borghi J., Mueller, D., Patouillard, E., & Mills, A. (2006).Countdown to

2015: tracking donor assistance to maternal, newborn, and child health. *Lancet*, 368(9541), 1077-87.

Rajaratnam, R., Marcus, J., Flaxman, A., Wang, H., Leving-Rector, A., Dyer, L., Costa, M., Lopez, A. & Murray, C. (2013) Neonatal, postnatal, childhood, and under-5 mortality for 187 countries, 1970-2010; a systematic analysis of progress towards Millennium Development Goal 4. *Lancet,* 375(9730) 1988-2008.

Rasmussen, Z., Pio, A., & Enarson, P. (2000). Case management of childhood pneumonia in developing countries: Recent relevant research and current initiatives. *International Journal of Tuberculosis & Lung Disease*, *4*(9), 807-826.

Reyburn, H., Mwakasungula, E., Chonya, S., Mtei, F., Bygbjerg, I., Poulson, A., & Olomi, R., (2008) Clinical assessment and treatment in paediatric wards in the north-east of the United Republic of Tanzania. *Bulletin of the World Health Organization*, 86(2), 132-9.

Rogers, E. (2003). Diffusions of Innovations (Fifth edition). Free Press, New York.

Rudan, I., Boschi-Pinto, C., Biloglay, Z., Mulholland, K., & Campbell, H. (2008) Epidemiology and etiology of childhood pneumonia. *Bulletin of the World Health Organization*, 86(5), 408-16.

Rudan, I., Tomaskovic, L., Boschi-Pinto, C., & Campbell, H. (2004). Global estimate of the incidence of clinical pneumonia among children under five years of age. *Bulletin of the World Health Organization, 82*(12), 895-903.

Rutherford, M. E., Dockerty, J. D., Jasseh, M., Howie, S., Herbison, P., Jeffries, D. J., Leach, M. Stevens, W., Mulholland, K., Adegbola, R. A., & Hill, P. C. (2009). Access to health care and mortality of children under 5 years of age in the Gambia: A case-control study. *Bulletin of the World Health Organization, 87*(3), 216-224.

Sarrassat, S., Lalou, R., Cisse, M., & Hesran, J. (2011). Management of uncomplicated malaria in children under 13 years of age at a district hospital in Senegal: from official guidelines to usual practices. *Malaria Journal*, 10, 285.

Scott, J., Brooks, W., Peiris, J., Holzman, D. & Mulholland, E. (2008) Pneumonia research to reduce childhood mortality in the developing world. *Journal of Clinical Investigation,* 118(4), 1291-1300.

Sylla, A., Gueye, E. H., N'diaye, O., Sarr, C. S., Ndiaye, D., Diouf, S., Fall, L., Moreira, C., & Sall, M. G. (2007). [Low level educated community health workers training: A strategy to improve children access to acute respiratory treatment in Senegal]. [Article in French] *Archives De Pediatrie*, 14(3), 244-248.

Theodoratou, E., Al-Jilaihawi, S., Woodward, F., Ferguson, J., Jhass, A., Balliet, M., Kolcic, I. Sadruddin, S., Duke, T., Rudan, I., & Campbell, H. (2010). The effect of case management on childhood pneumonia mortality in developing countries. *International Journal of Epidemiology, 39*(supplement 1).

United Nations Children's Fund [UNICEFa], (2014). *Levels and trends in childhood mortality, Report 2012*. New York, New York.

United Nations Children's Fund [UNICEFb], (2014). *State of the world's children 2014, Every child counts.* New York, New York.

United Nations Children's Fund/World Health Organization (UNICEF/WHO) (2006) *Pneumonia: the forgotten killer of children.* WHO Press, Geneva, Switzerland.

United Nations Children's Fund/World Health Organization (UNICEF/WHO) (2009). *Global Action Plan for prevention and control of pneumonia.* WHO Press, Geneva, Switzerland.

United Nations Children's Fund/World Health Organization (UNICEF/WHO) (2013). *End preventable deaths: Global Action Plan for Prevention and Control of Pneumonia and Diarrhoea.* WHO Press, Geneva, Switzerland.

United Nations Development Programme (UNDP) (2014) Human Development Report. Retrieved from: http://hdr.undp.org/en/countries/profiles/SEN, accessed November 20, 2014

United Nations Secretary-General (2010). *Global Strategy for women's and children's health. The partnership for maternal, newborn and child health*, New York.

United States Agency for International Development (2011). Retrieved from: senegal.usaid.gov/sites/default/files/FS_Health_8_10_FINAL.pdf

Uwaezuoke, S. N., Emodi, I. J., & Ibe, B. C. (2002). Maternal perception of pneumonia in children: A health facility survey in Enugu, eastern Nigeria. *Annals of Tropical Paediatrics, 22*(3), 281-285.

World Bank (2014). *Senegal data.* Accessed November 20, 2014 http://data.worldbank.org/country/senegal#cp_wdi

World Health Organization (2005). *Handbook of Integrated Management of Childhood Illness.* http://whqlibdoc.who.int/publications/2005/9241546441.pdf

World Health Organization (2005). *Pocket Guide for Hospital Care of Children*. http://whqlibdoc.who.int/publications/2005/9241546700.pdf

World Health Organization [WHO a] (2013). *World Health Statistics 2013*. Geneva, Switzerland. Retrieved from who.int.gho. Accessed on November 20, 2014

World Health Organization [WHO b] (2013). *Global Health Workforce Statistics.* Retrieved from: Who.int/hrh/hwstats/en, Accessed on November 20, 2014

Zurn, P., Codjia, L., Sall, F. L., & Braichet, J. M. (2010). How to recruit and retain health workers in underserved areas: The Senegalese experience. *Bulletin of the World Health Organization*, 88(5), 386-389.

Table 1. Diffusion of Innovation components and areas of study

Diffusion of Innovation framework components	
Characteristics of the innovation	**Guideline factors**
Availability of supplies and equipment	Assessment equipment, scale and thermometer Antibiotics and supplies Oxygen equipment and supplies Suction equipment and supplies Nasogastric feeding supplies
Availability of nursing time	Nursing assessments Administration of antibiotics Delivery of oxygen Suctioning secretions Delivery nasogastric feedings
Characteristics of innovators	**People factors**
Nursing procedural confidence	Measure pediatric vital signs and weight Administration of oxygen to children Recognize worsening respiratory distress Measure oral and IV intake for children Administer antibiotics to children
How-to knowledge	4 antibiotic administration recommendations 4 oxygen administration recommendations 5 nursing assessment recommendations 2 suctioning and nasogastric feeding recommendations
Knowledge of the innovation	**Guideline awareness**
Guideline awareness	Awareness of WHO guidelines Guidelines followed in delivery of care

Table 2. Nursing survey itemized responses related to nursing knowledge, survey page 1

Please check the box that best describes your care of children with pneumonia:	**Never**	**Rarely <25% of the time**	**Some-times 25-50%**	**Often 50-75% of the time**	**Usually >75% of the time**	**No respo nse**
Antibiotics are given at the correct time	*0*	*0*	*0*	*1*	*10*	*0*
Children with severe or very severe pneumonia are given antibiotics by intravenous or intramuscular route	*0*	*0*	*0*	*3*	*8*	*0*
Children under 2 years of age are given intramuscular injections only in the lateral thigh	*0*	*0*	*0*	*1*	*9*	*1*
Children over 2 years of age are given IM injections only in the upper outer buttocks	*1*	*1*	*1*	*6*	*2*	*0*
Oxygen is delivered to children with very severe pneumonia and/or respiratory distress	*0*	*0*	*0*	*1*	*10*	*0*
When used, the oxygen system is checked at least every 3 hours to be sure it is connected, in place and functioning	*0*	*0*	*1*	*2*	*7*	*1*
Children with severe or very severe pneumonia have their oxygen saturation measured on admission if oximetry is available	*2*	*0*	*0*	*3*	*4*	*2*
When oxygen saturation measurement is not available, oxygen is delivered until the child's breathing rate is less than 70 breaths per minute and chest indrawing is resolved	*2*	*2*	*0*	*4*	*1*	*2*
Suction equipment is available and used to clear secretions when the child cannot clear the secretions	*0*	*0*	*0*	*1*	*10*	*0*
Children with severe pneumonia are assessed by a nurse at least every 6 hours	*0*	*0*	*0*	*1*	*6*	*3*
Children with very severe pneumonia are assessed by a nurse at least every 3 hours	*0*	*0*	*1*	*2*	*5*	*3*
A written record is maintained for each child with documentation of the nursing assessment	*0*	*0*	*0*	*0*	*9*	*2*
Heart rate, respiratory rate and temperature are measured at each assessment and written in the record	*0*	*0*	*0*	*1*	*8*	*2*
The level of consciousness and ability to take oral fluids is noted with the nursing assessment	*0*	*0*	*0*	*3*	*6*	*2*
A record of the daily intake of the child's drinking, eating and breastfeeding is maintained	*2*	*0*	*1*	*3*	*3*	*2*
Liquids and/or medications are given through a nasogastric tube when children are unable to take oral liquids and medications	*0*	*0*	*0*	*4*	*5*	*2*
The child's weight is measured and recorded at the time of admission	*0*	*0*	*0*	*0*	*9*	*2*
Nurses are familiar with the care of children with pneumonia recommendations from the 'Pocket Book of Hospital Care for Children'	*0*	*2*	*2*	*2*	*3*	*2*
The recommendations from the 'Pocket Book of Hospital Care for Children' are followed when caring for children with pneumonia	*0*	*4*	*1*	*1*	*3*	*2*

Table 3. Nursing survey itemized responses related to procedures and confidence, survey page 2

How significantly does each item affect your ability to complete an assessment, weight and vital signs for children with pneumonia?	***Not significant***	***Slightly significant***	***Moderately significant***	***Extremely significant***	***No response***
Assessment supplies and equipment are available	*0*	*3*	*4*	*4*	*0*
Proper training was given	*3*	*0*	*5*	*3*	*0*
Enough time is available	*0*	*0*	*6*	*4*	*0*
How significantly does each item affect your ability to administer antibiotics?	***Not significant***	***Slightly significant***	***Moderately significant***	***Extremely significant***	***No response***
Antibiotics and/ or supplies for administration are available	*1*	*1*	*4*	*5*	*0*
Proper training was given	*3*	*0*	*5*	*2*	*1*
Enough time is available	*0*	*0*	*6*	*4*	*0*
How significantly does each item affect your ability to administer oxygen to children with pneumonia?	***Not significant***	***Slightly significant***	***Moderately significant***	***Extremely significant***	***No response***
Oxygen and/or oxygen supplies are available	*0*	*1*	*2*	*7*	*1*
Proper training was given	*3*	*0*	*7*	*1*	*0*
Enough time is available	*0*	*1*	*7*	*2*	*1*
How significantly does each item affect your ability to give nasogastric medications or liquids?	***Not significant***	***Slightly significant***	***Moderately significant***	***Extremely significant***	***No response***
Nasogastric tubes and supplies are available	*1*	*2*	*6*	*2*	*0*
Proper training was given	*3*	*3*	*4*	*1*	*0*
Enough time is available	*1*	*2*	*5*	*3*	*0*
How significantly does each item affect your ability to suction secretions if the child with pneumonia cannot clear secretions?	***Not significant***	***Slightly significant***	***Moderately significant***	***Extremely significant***	***No response***
Suction supplies are available	*1*	*2*	*2*	*6*	*0*
Proper training was given	*3*	*1*	*6*	*1*	*0*
Enough time is available	*1*	*0*	*7*	*3*	*0*
Please rate your confidence in your ability to:	***Not at All confident***	***Somewhat confident***	***Moderately confident***	***Very confident***	***No response***
Measure Pediatric vital signs and weight	*0*	*0*	*0*	*11*	*0*
Administer oxygen to children	*0*	*0*	*2*	*9*	*0*
Recognize worsening respiratory distress	*0*	*0*	*1*	*10*	*0*
Measure oral and IV intake for children	*0*	*0*	*2*	*8*	*1*
Administer antibiotics to children	*0*	*0*	*1*	*10*	*0*

Table 4. Mean responses for survey questions by Diffusion of Innovation category.

Diffusion of Innovation framework component results		**Mean responses**
Characteristics of the innovation	**Guideline factors**	**Impact on delivery of care**
Availability of supplies and equipment	Assessment equipment	Moderately significant
	Antibiotics and supplies	Moderately significant
	Oxygen equipment and supplies	Extremely significant
	Suction equipment and supplies	Extremely significant
	Nasogastric feeding supplies	Moderately significant
Availability of nursing time	Nursing assessments	Moderately significant
	Administration of antibiotics	Moderately significant
	Delivery of oxygen	Moderately significant
	Suctioning secretions	Moderately significant
	Delivery nasogastric feedings	Moderately significant
Characteristics of innovator	**People factors Nursing preparation**	**Confidence in ability**
Nursing procedural confidence	Measure pediatric vital signs and weight	Very confident
	Administration of oxygen to children	Very confident
	Recognize worsening respiratory distress	Very confident
	Measure oral and IV intake for children	Very confident
	Administer antibiotics to children	Very confident
How-to knowledge - Antibiotic administration	**How-to knowledge**	**Description of practice**
	Antibiotics given on time	Usually
	IV or IM route for severe pneumonia	Usually
	Under age 2 yrs, IM lateral thigh	Usually
	Over age 2 yrs, IM buttocks	Often
-Oxygen delivery	Oxygen delivered for severe pneumonia	Usually
	Oxygen saturation on admission	Often
	Oxygen delivered until RR under 70	Often
	Oxygen system checked every 3 hrs	Usually
-Nursing assessment	Written record, assessment documented	Usually
	HR, RR, Temp with each assessment	Usually
	LOC and ability to take oral liquids noted	Usually
	Daily intake recorded	Often
	Assessment every 3 hrs severe pneumonia	Usually
	Assessment every 6 hrs very severe	Usually
-Additional care	Suction secretions as needed	Usually
	Liquid via nasogastric if needed	Usually
Knowledge innovation	**Guideline awareness**	**Description of practice**
Guideline awareness	Awareness of WHO guidelines	**Often**
	Guidelines followed in delivery of care	**Sometimes**

Table 5. Written responses to open ended survey question

What would help me to better care for children with pneumonia?
Continuing education
To better care for children ill with pneumonia, we need continuing education
I want training to improve the health of the children
We need materials and continuing education, also construction of a better building to improve the conditions
Equipment available and permanent, continuing education for the personnel
That the equipment be replaced and that we have the equipment and medications…etc.
Adequate equipment for our use, regular training sessions for the personnel
We need materials and continuing education to treat children with pneumonia better

Table 6. Summary of recommendations

Summary of recommendations		
Component	**Area studied**	**Recommendations**
Characteristics of the guidelines	Availability of time	Recommend examination of nursing staffing to determine appropriate staffing patterns which allow for completion of recommended care. Further assessment to determine if a shortage of qualified nurses exists in the area
	Availability of supplies and equipment	Establish appropriate par levels of necessary equipment and supplies
		Examine policies and procedures for obtaining and maintaining materials and adjust as needed to ensure adequate availability
		Recommend hospital administrators include nursing input to develop policies and procedures
		Anticipate potential need to explore funding sources to improve availability of equipment and supplies
Knowledge of innovation	Guideline awareness	Provide copies of WHO 'Pocket book for hospital care of children' in French for pediatric unit
		Recommend considering establishment of formal continuing education program
People factors	How –to knowledge	Recommend nursing education regarding maintaining documentation of intake, choice of IM sites, and use of oxygen saturation measurement and oxygen delivery
	Nursing preparation	Provide support for strong nursing care delivery
General recommendations		Clinical study of current patient outcomes and correlation with delivered clinical care
		Investigate strategies shown to be effective in similar settings and assess for feasibility in this hospital
		Community education to increase awareness of services available for children with pneumonia at hospital and effectiveness of treatment to promote seeking health care for ill children

Figure 1. Schematic representation of Rogers' "Diffusion of Innovation" framework developed from Rogers, E. (2003). Diffusion of Innovations. Free Press, New York.

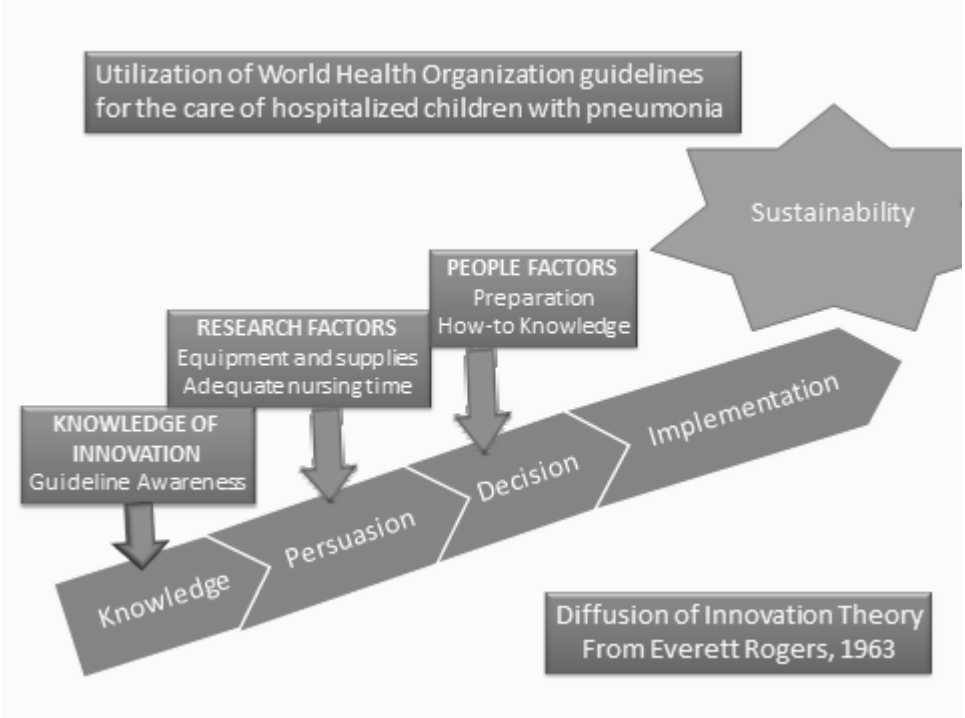


Figure 2. Nurses survey impact of available time for procedures

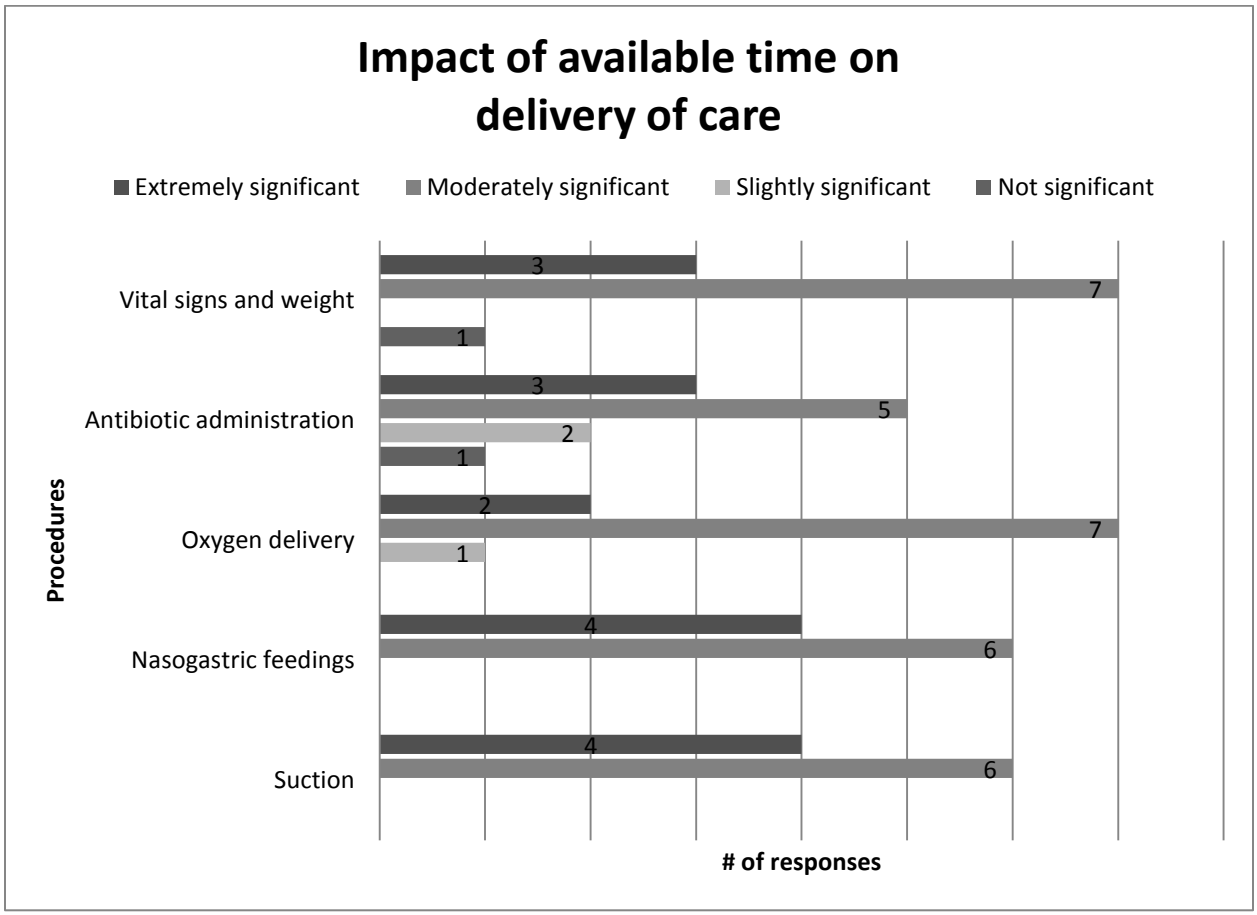


Figure 3. Nurses survey of impact of available supplies

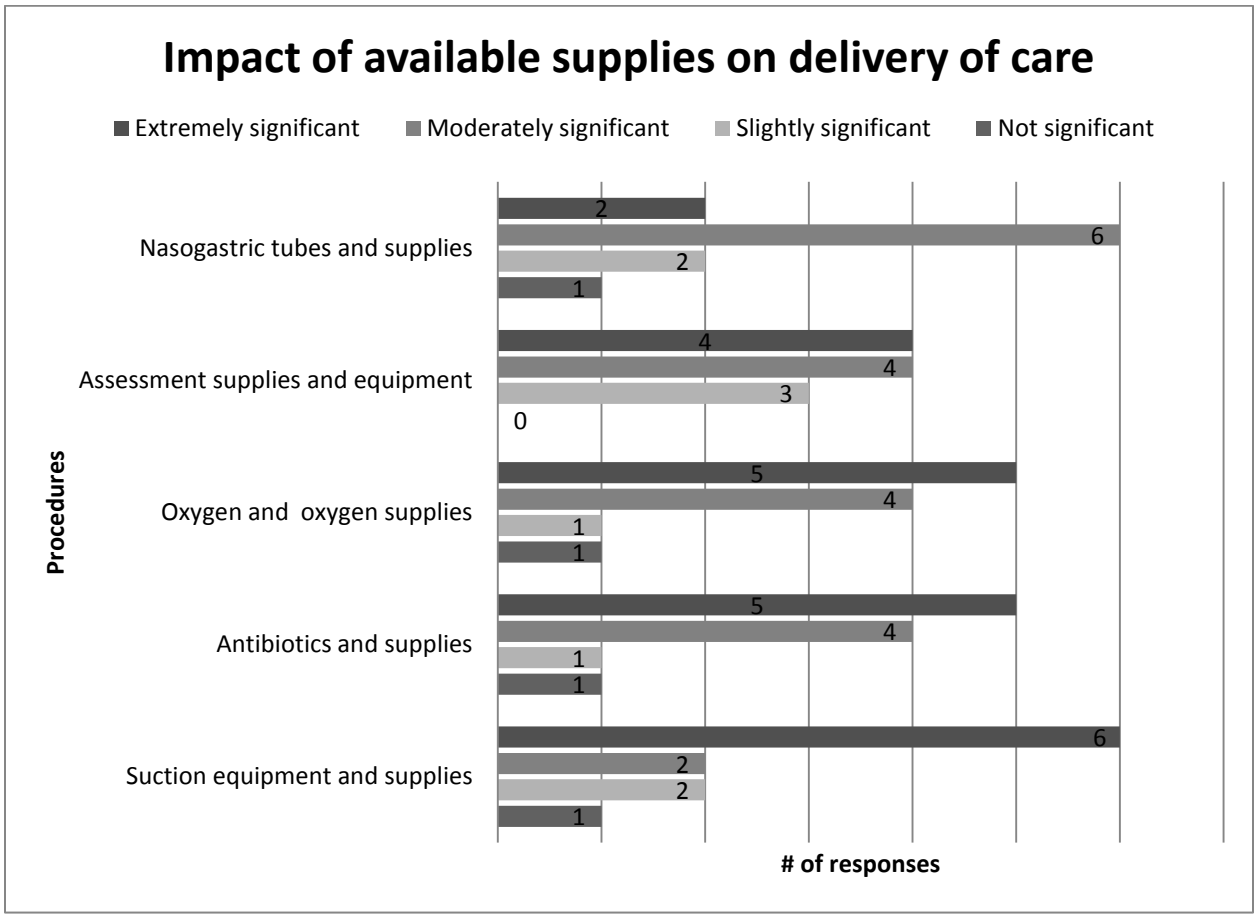


Figure 4. Nursing survey of confidence in performing nursing skills

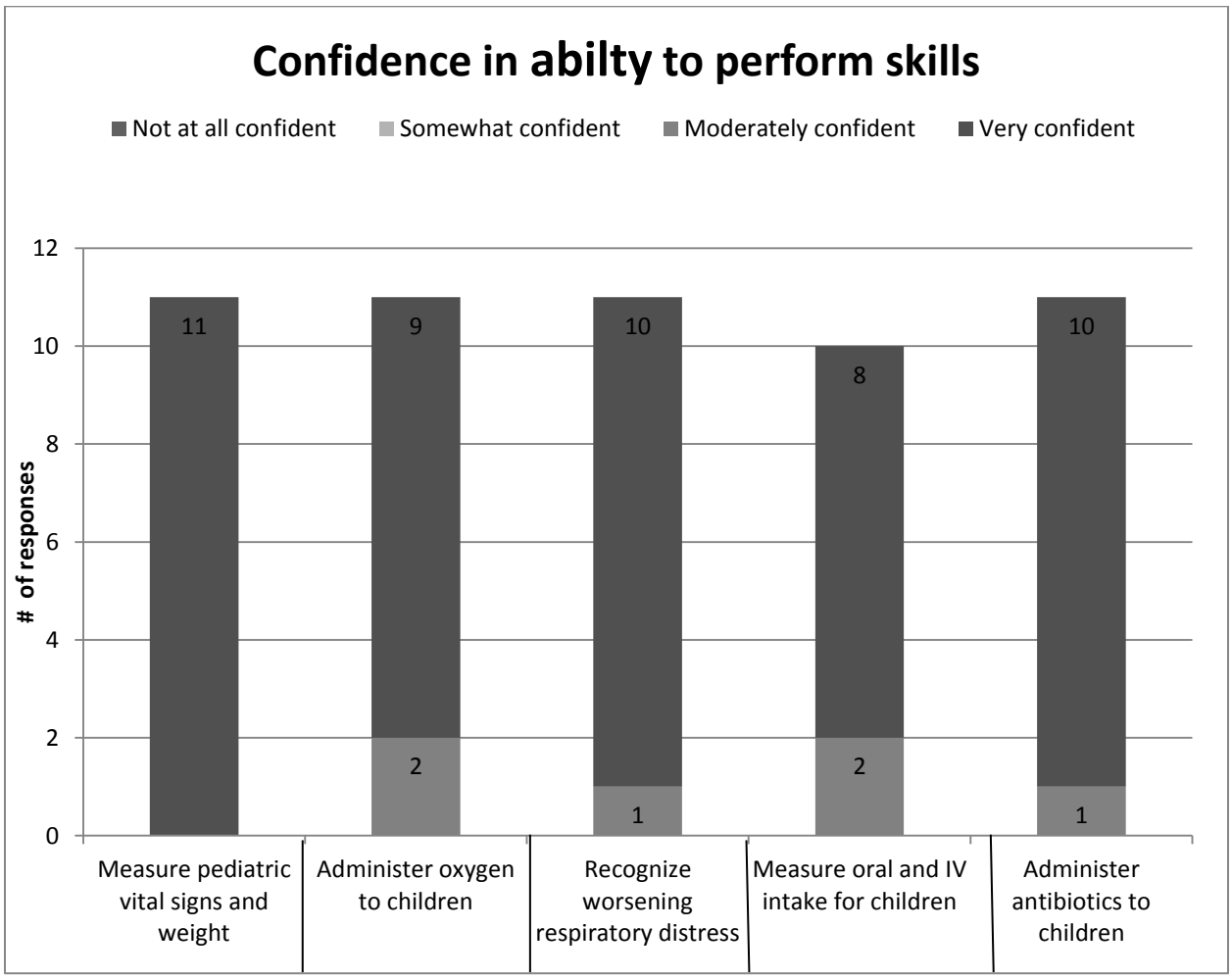


Figure 5. Nurses survey of how-to knowledge antibiotic administration

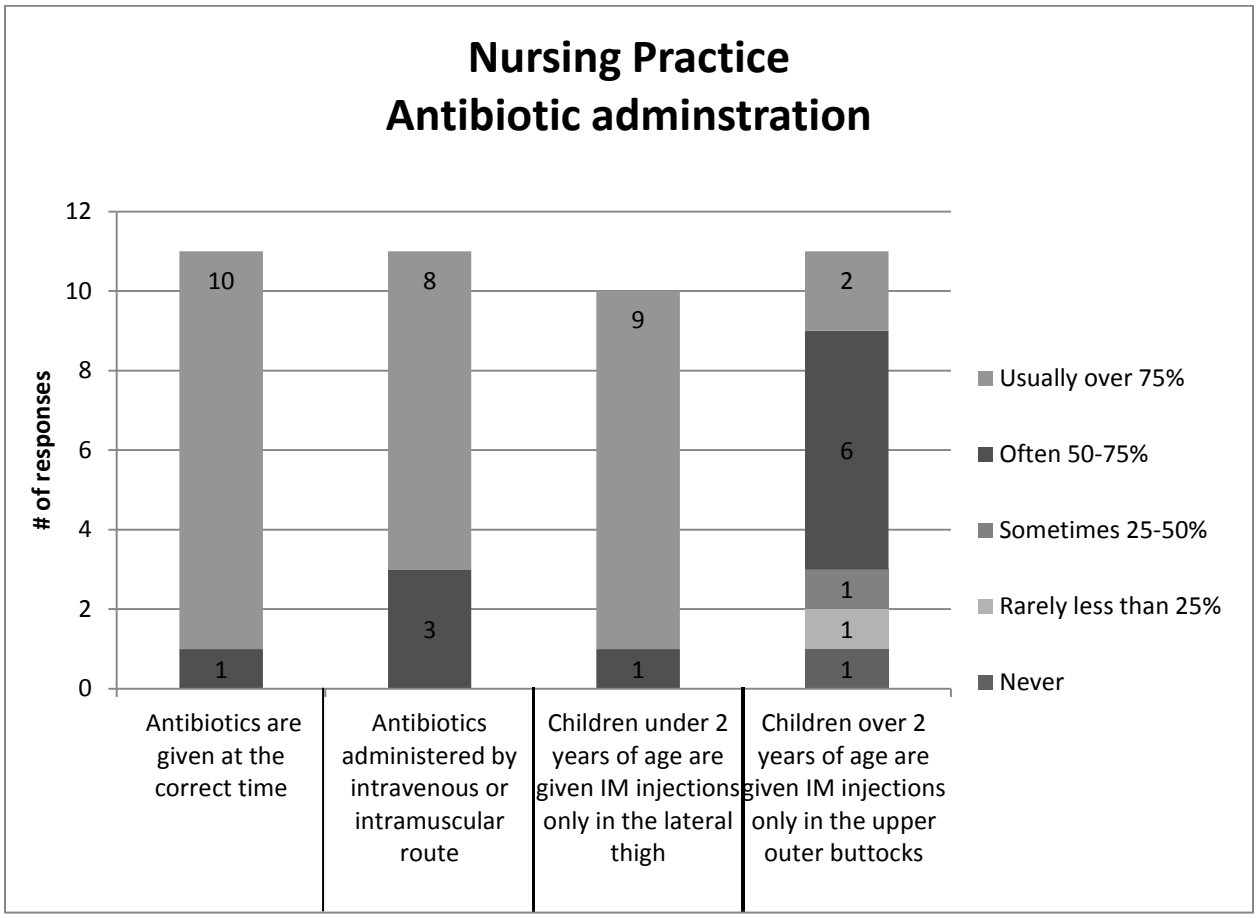


Figure 6. Nurses' survey of how-to knowledge related to oxygen delivery

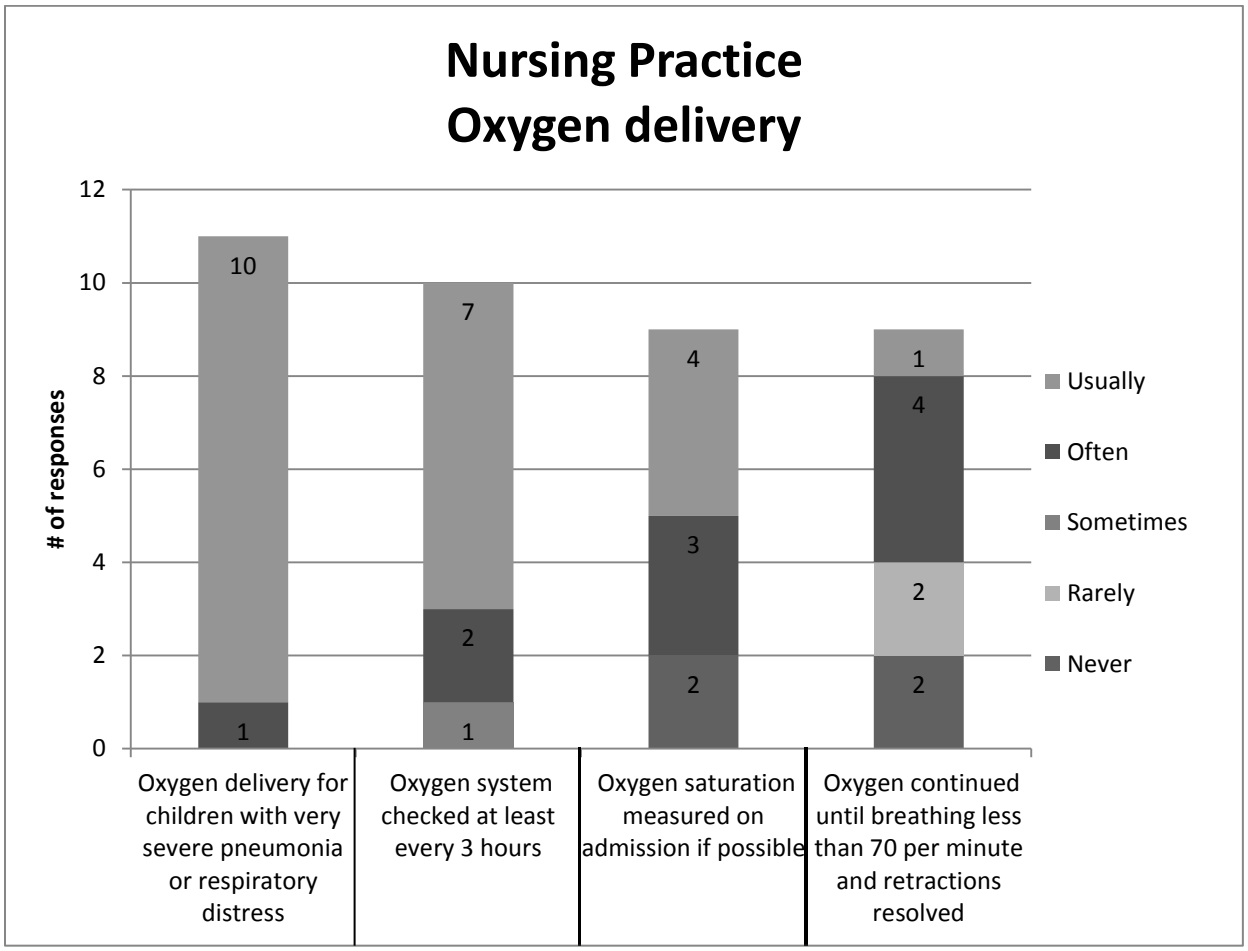


Figure 7. Nurses survey of how-to knowledge nursing assessment

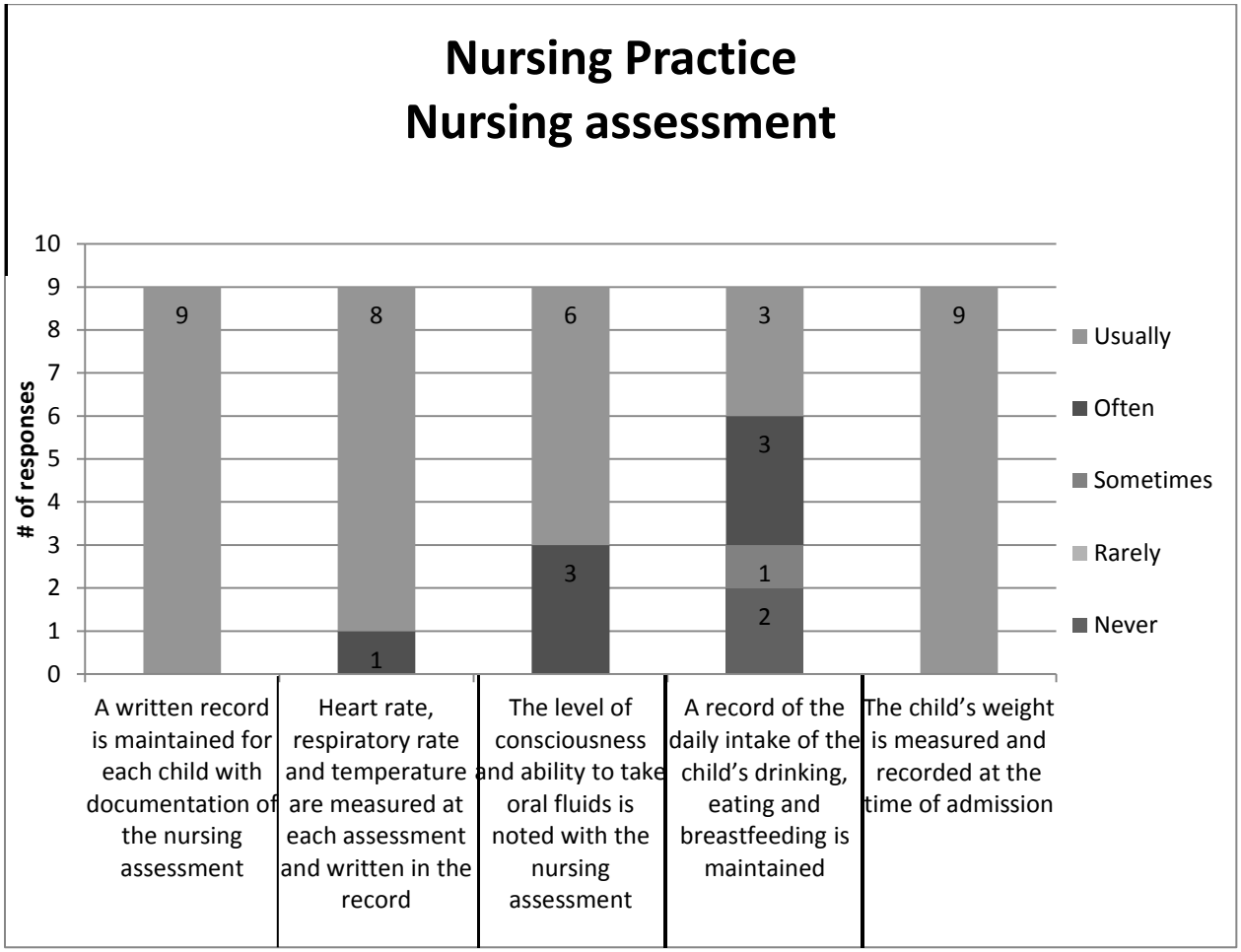


Figure 8. Nurses survey of how-to knowledge suction and nasogastric feedings

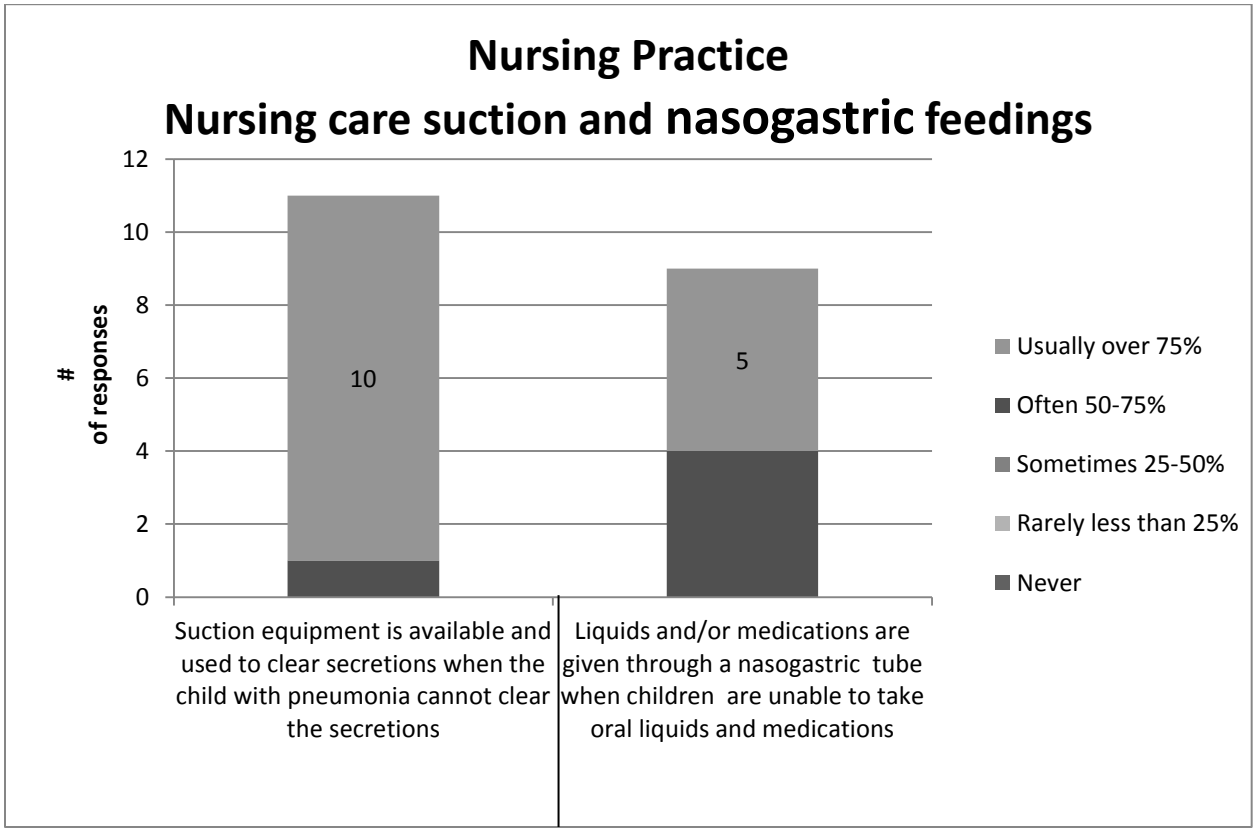
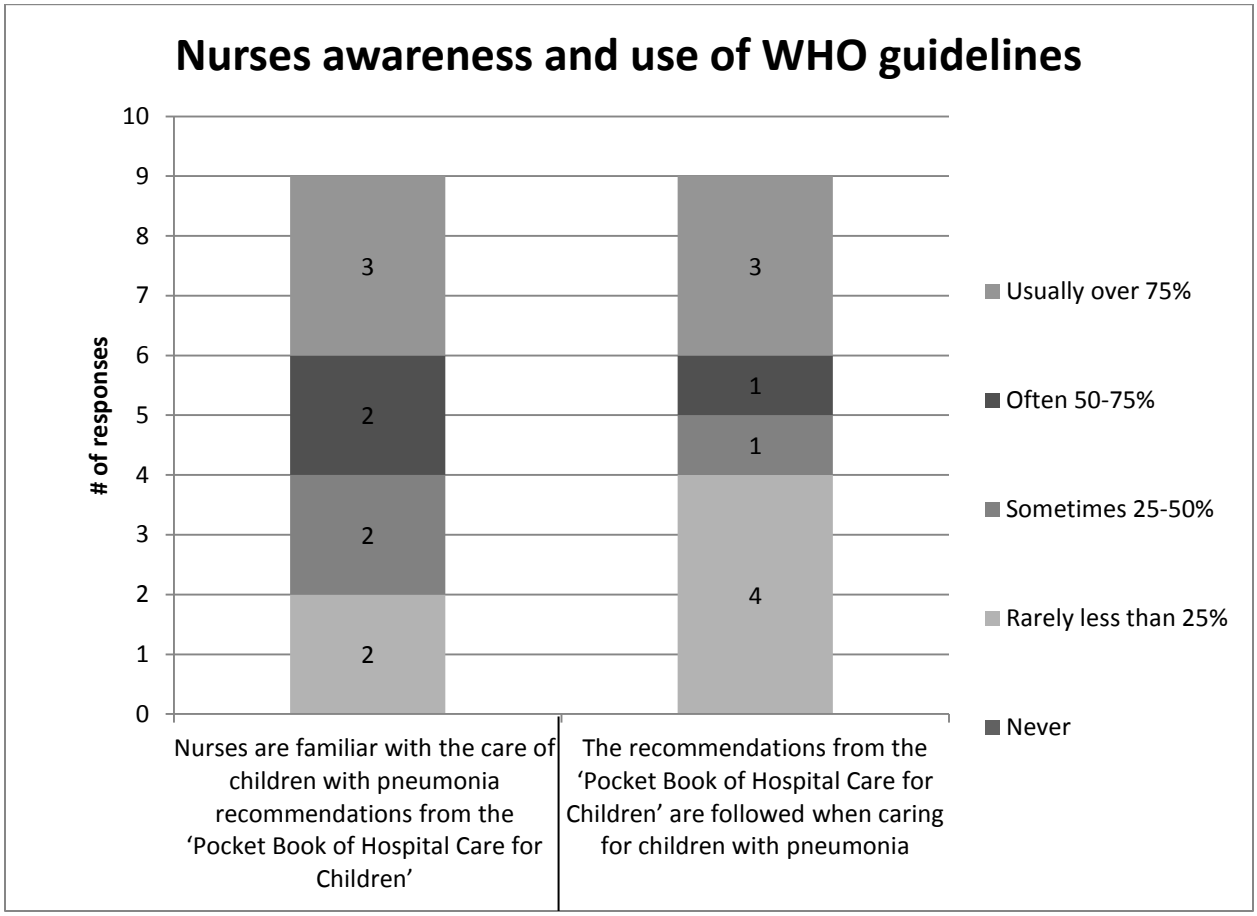


Figure 9. Nurses survey of awareness and use of WHO guidelines



Appendix A

International Nursing Review manuscript guidelines

All manuscripts submitted to *International Nursing Review* should include:

Title Page: The title page must be a separate file; do not include it in the manuscript file. It must include a title of no more than 10 words; names, credentials (nursing qualifications, followed by academic, and then honours), job title, department and institution for each author; the name, address, telephone, fax and e-mail for the corresponding author; the source of funding statement; the conflict of interest statement; and any acknowledgements. NOTE: The author's name should appear only on the title page, not in the abstract or manuscript.

Main Text of Articles: Manuscripts must be in English, between 3000 and 6000 words in length inclusive of a 250-300 word abstract and no more than 40 references. Wherever possible and appropriate, references used should be within the last 5 years.

Authors should indicate the data sources for their articles. For example:

5.1. Empirical research study

An empirical research study consists of an article on original research that has not been previously published in its current format.
• Abstracts for reports of empirical studies should be between 250-300 words structured under appropriate headings and include the Aim, Background, Introduction, Methods, Results or Findings, Discussion, Conclusion and Implications for Nursing and/or Health Policy. It helps the 'flow' of the article if the abstract headings are used to structure the main text, where appropriate references in support of research methods should be cited. Dates of data collection should be given and should not be more than 4 years old.
• Up to 3 tables and/or figures may be included.
• Up to ten keywords in alphabetical order should follow the abstract including, if appropriate, the countries that are the subject of the article.
• Articles involving statistical methods should state the source of research subjects, selection methods, sample size, response rate and main results with confidence intervals and actual P values.
• The Discussion should consider the policy implications of the research, where appropriate, for governments, management, education and/or practice; including the global dimensions of the study.

Appendix B

Manuscript for submission to International Nursing Review

Title: Assessment of hospital nursing care for children with pneumonia in Senegal

Authors:

Diane Karowitz Dramé, DNP Candidate, CPNP-AC, CPNP-PC, RN

Doris F. Glick, Ph.D., RN, Associate Professor Emeritus, University of Virginia School of Nursing

Mary E. Gibson, Ph.D., RN, Associate Professor, University of Virginia School of Nursing

Elizabeth Iselin, M.D., Pediatric Intensivist, Bon Secours Health System

Corresponding author:

Diane Karowitz Dramé

313 8th Street NW

Charlottesville, VA 22903

Phone: # 434-434-3428

E-mail: dianekarowitz@yahoo.com

This research received no specific grant form any funding agency in the public, commercial, or not-for-profit sectors.

No conflict of interest has been declared by the authors.

Assessment of hospital nursing care for children with pneumonia in Senegal

Aim: To assess inpatient nursing practice for children with pneumonia in a Senegalese hospital, and compare the reported practice with the World Health Organization 'Pocket book of hospital care for children' recommendations. Identify barriers to implementation.

Background: Pneumonia is a significant cause of pediatric mortality in Senegal. Appropriate inpatient care for children with severe pneumonia is needed to reduce pediatric mortality. The World Health Organization (WHO) 'Pocket book of hospital care for children' provides recommendations which reduce mortality, but world-wide implementation has not been achieved. Previous studies have found inadequate nursing knowledge, a lack of supplies and staffing shortages negatively impact the delivery of care.

Methods: Eleven pediatric hospital nurses in Senegal completed a survey on nursing practice.

Results: The nurses mean responses indicates the majority of the WHO recommendations are usually practiced and none indicated any recommendation was never or rarely practiced. The nurses reported feeling very confident in their ability to complete the required nursing skills. The availability of adequate nursing time had a moderately significant impact on their ability to deliver care and the availability of necessary materials had extremely or moderately significant impact.

Conclusion: The reported nursing care of children with pneumonia in Senegalese hospital is consistent with the WHO guidelines. Nursing knowledge is a significant strength in guideline compliance. The potential lack of adequate supplies, functional equipment and adequate nursing time were identified as potential implementation barriers.

Implications for nursing: Nursing practice consistent with the WHO guidelines affirms the expertise of nurses in caring for ill children in developing countries. Implementation of the WHO recommendations with the involvement of nurses should be supported. International nursing communication and support is possible across language and cultural differences, resulting in a beneficial exchange of nursing knowledge.

Keywords: hospital, nursing practice, pediatric, pneumonia, Senegal

Introduction

Pneumonia, a leading cause of global childhood mortality, is a significant cause of under age 5 years pediatric mortality in Senegal, West Africa, where approximately 13% of pediatric deaths are due to pneumonia (UNICEF a 2014). In Senegal, a country of about 14 million people, there were about 30,000 pediatric deaths in 2012, with approximately four thousand due to pneumonia (UNICEF a 2014). In contrast, in developed countries, pneumonia is rarely fatal and usually treatable with common antibiotics and supportive care.

Senegal is a developing country, ranking 163 of 187 countries on the UN Human Development Index. The pediatric mortality rate in Senegal is ranked 43rd highest of all countries. Significant decreases in the under age 5 years of age mortality rate have been achieved, dropping from 278 deaths per 1,000 children in 1970, to 142 deaths per 1,000 children in 1990, and more recently to 55 deaths per 1,000 children in 2012(UNICEF b 2014). However continued progress is needed as the possibility of dying under 5 years of age in Senegal continues to be 9 times greater than in the United States, which ranks 150th in worldwide pediatric mortality(UNICEF b 2014).

The goal of United Nations Millennium Development Goal #4 is to reduce worldwide pediatric mortality from all causes by two-thirds of 2000 levels by 2015.This goal is unlikely to be met without a significant reduction in worldwide pediatric pneumonia deaths. The global impact of pneumonia is staggering, causing of about one-fifth of all under 5 childhood deaths with approximately 99% of these deaths occurring in developing countries such as Senegal (International Vaccine Access Center 2012). In developed countries, approximately 3-4% of children are ill with an episode of pneumonia annually (McIntosh 2002). In comparison, more than 25% of children in developing countries will experience an episode of pneumonia each year (Rudan, Tomashkovic, Borshi-Pinto & Campbell 2004). An estimated 7%-13% of annual pneumonia episodes met the World Health Organization (WHO) criteria for diagnosis as severe or very severe pneumonia, for which hospitalization is recommended, yet only 2%-3% of children with pneumonia worldwide are hospitalized yearly (Rudan et al 2004). Unfortunately, about 5%-10% of children with pneumonia are not receiving the recommended hospital care, which could have a significant negative impact on pediatric mortality.

Multiple factors reduce hospitalization rates for children with pneumonia, including a mistrust of hospital care, lack of caretaker awareness of effective treatment for pneumonia and a lack of access to facilities with appropriate services. Although prevention of pneumonia is ideal, accessible and appropriate treatment for the children who have developed pneumonia is necessary. Access to primary care services for treatment of non-severe pneumonia has been problematic in many developing countries. Programs utilizing community health workers to treat pediatric pneumonia have been developed and shown to be effective. In Senegal, approximately ¼ of children with pneumonia are treated by community health workers, who are often

volunteers and may not be literate (Sylla, Gueye, Ndiaye, O., Sarr, Ndaiye D., Diouf, Fall, Moreira & Sall, 2007).

Hospital care requires educated and literate health care providers, both physicians and nurses, to provide skilled services which are not available in the community. The internationally accepted guidelines for the hospital care of children are contained in the WHO 'Pocket book of hospital care for children'. Specific recommendations for the care of children with pneumonia are related to skilled nursing assessment, parenteral antibiotic administration, administration of oxygen and supportive care, such as nasogastric feedings and suctioning of secretions. The guidelines have been shown to reduce pediatric pneumonia mortality in low-resource settings, such as in Malawi, a sub-Saharan African country also with high pediatric mortality rates. The pediatric pneumonia mortality rate in the public hospital system was reduced by 50%, by introducing standard pneumonia case management practices (Enarson, P. Gie, Enarson, D. & Mwansambol 2009). The rate of pediatric mortality due to pneumonia prior to the project was 200 deaths per 1,000 children under age five years, and after implementation of a program to manage supplies and materials, offer staff training and provide monthly evaluations, the pediatric pneumonia mortality rate was still elevated but significantly improved; dropping to a rate of 100 deaths per 1000 children (Enarson et al 2009).

Although the effectiveness of the guidelines has been demonstrated, there has not been global implementation of the guidelines. Ensuring hospitals provide the recommended care could prevent pediatric mortality, both in the delivery of life saving care, and by reducing the mistrust of hospital care which could increase the health care seeking behaviors of caretakers. Only 31% of children with suspected pneumonia received any healthcare services, thus health care seeking needs to increase for pneumonia mortality to decrease (United Nations Children's Fund/World

Health Organization [UNICEF/WHO] 2013)). The availability of guideline consistent hospital care, along with the caretakers' accessing of the services, could allow many children to survive pneumonia episodes.

Currently, little information is found in the literature related to the use of the WHO guidelines in hospitals in developing countries and no information could be found in the literature related to the nursing care of children with pneumonia in hospitals in Senegal. One study from Senegal published in 2003, found 12% of the 114 hospitalized children studied were diagnosed with pneumonia and the pneumonia case mortality rate was 33% (Eshave, Bille, Audet, Talla, and Vaudaus & Gehri 2003). This study confirmed a high pneumonia incidence rate and mortality rates in Senegal, but the nursing care practices were not described. Improved knowledge of the current inpatient nursing practice in sub-Saharan Africa is necessary to address the high inpatient pneumonia mortality rates.

In addition to the need for educated health care providers, specific supplies and equipment are necessary to deliver care according to the WHO guidelines. A number of studies have described inadequate services in hospitals in sub-Saharan Africa, with hospitals being described as a weak component of many health care systems in low resource settings (Nolan, Angos, Cunha, Muhe, Qazi, Simoes, Tamburlini, Weber & Pierce 2001). In the 1990's, a large study found inadequate staffing, deficiencies in assessment, lack of appropriate protocols and lack of equipment, supplies and medications to be significant barriers to the delivery of care in low resource settings (Nolan et al 2001). A study published in 2009 found many hospitals needed improvement in pediatric emergency and critical care services (Baker 2009). For example, a study of 13 public hospitals in Tanzania found significant deficiencies in basic pediatric nursing assessment. Documentation of the child's weight was found for ½ of inpatient children, and less

than 10% of the children had documentation of their level of consciousness or ability to take oral liquids. In addition, respiratory rate was documented in only 15% of the 193 children diagnosed with pneumonia (Reyburn, Mwakasungula, Chonya, Mtei, Bygbjerg, Poulson & Olomi 2008). This nonadherence to the WHO recommendations could have significant impact on patient outcomes.

Equipment and supply shortages have also been described. In Kenya, a study of 14 hospitals found limited supplies, such as oxygen supply and lack of equipment, such as nasal cannulas and flow meters affected the delivery of care (English, Esamai, Wasunna, Were, Ogutu, Wamae, Snow & Peshu 2004). The availability of oxygen therapy can be a crucial component in the care of many ill children. Survival may be improved for children will severe or very severe pneumonia with oxygen therapy alone (Enarson et al 2009). An estimated 122,000 children with pneumonia could survive annually if oxygen delivery was available worldwide and about 1.5 to 2.7 million children could benefit from oxygen therapy yearly if it were available (Catto, Zgaga, Theodoratou, Huda, Nair, Arifeen, Rudan, Duke & Campbell 2011). In New Guinea, a controlled study found the use of oximetry and oxygen decreased pneumonia deaths by one-third (Duke, Wandi, Jonathan, Matai, Kaupa, Saavu, Subhi, & Peel 2008). The administration of oxygen is an important component of the WHO guidelines for care of children with pneumonia and an assessment of oxygen delivery capability is necessary to determine guideline compliance.

Nurse staffing shortages can also impact the delivery of hospital care in low-resource areas. Senegal's availability of nurses ranks 163 of 187 countries worldwide (WHO Global Health Workforce Statistics 2013). The number of health care providers in Senegal is significantly less than the worldwide average of 3 nurses per 1,000 people. In Senegal, there is about one nurse per 4,200 people. By comparison, there are almost 10 nurses per 1,000 people in

the United States, or 40 times more nurses per population in the U.S. than in Senegal (USAID 2010). Although inadequate nurse staffing leads to a lack of time to provide the nursing care recommended by the guidelines, it is not known this affects the care of hospitalized children in Senegal.

The review of the literature did not reveal information about whether local hospitals in Senegal have similar knowledge deficits, staffing and equipment issues as found in hospitals in other sub-Saharan Africa countries. It is also not known whether the facilities in Senegal have adopted the WHO guidelines for the care of hospitalized children with severe or very severe pneumonia. The aim of this study is to assess and compare the reported practice with the WHO guidelines, using the Diffusion of Innovation framework. The three Diffusion of Innovation framework components examined were guidelines factors, people factors and knowledge of the recommendations.

Methods: Information was obtained from 11 nurses who completed a survey developed by the researcher to assess adoption of the nursing care guidelines for hospital care of children with severe or very severe pneumonia. The findings were compared with the WHO 'Pocket book of hospital care for children' guidelines, and strengths and barriers were identified using the Diffusion of Innovation framework. The 'Diffusion of Innovation' theory describes the step wise process of adopting new information into practice. The steps are influenced by different factors, which are assessed for their effect on adopted the practice. This study assesses the knowledge of the guidelines, people factors and guideline factors, which are needed in order for the guidelines to be implemented.

Setting: The information was collected at a local general hospital, Hospital Youssou M'bargane Diop, in Rufisque, Senegal. This facility is the first level health facilities in the district of approximately 300,000 to 500,000 people.

Inclusion Criteria: Registered nurses who work on the pediatric unit were eligible for participation in the study.

Sampling: Participants were recruited through convenience sampling. The chief nurse on the pediatric unit distributed the French translation of the survey, and collected the sealed envelopes to preserve confidentiality.

Sample size: Eleven nurses completed the survey.

Data collection procedures: The survey was developed by the researcher to query the implementation of specific recommendations of the WHO guidelines. The surveys were available to the nurses over a 5 days period ending August 4, 2014. The collected data were compiled in an Excel and Word files.

Analysis methods: The mean response and range of responses was determined for each Likert scale question. Results were correlated to the three Diffusion of Innovation components to identify strengths and weaknesses of the adoption of the guidelines. The written results of one open-ended question were summarized.

Results: Two guideline factors were examined, the availability of supplies and equipment needed to in order to deliver care which complies with the guidelines, and the availability of adequate nursing time needed to complete the recommended care. The required materials to complete nursing assessments are a scale and thermometer. Oxygen administration requires an oxygen source and special pediatric supplies for delivery. Suction catheters and suction equipment are needed to suction secretions. Specific supplies are also needed to administer

parenteral administration of antibiotics and to administer nasogastric fluids. Study respondents reported the availability of supplies and equipment had an extremely significant impact on their ability to administer oxygen and suction secretions. At the time of the survey, the pediatric unit had one functioning oxygen concentrator as the source for oxygen administration. They also reported the availability of supplies and equipment had a moderately significant impact on their ability to complete the three other procedures: nursing assessments, administration of antibiotics and providing fluids via nasogastric tubes. The potential unavailability of necessary materials is a barrier to the implementation of the guidelines.

The second guideline factor studied was the availability of adequate nursing time, which may indicate whether nurse staffing is adequate. The mean responses of the nurses indicated the availability of adequate time had a moderately significant impact on their ability to complete the each of the tasks recommended in the guidelines, which suggests the nurse staffing may not be adequate and is a potential barrier to the implementation of the guidelines. More study is needed to determine if staffing is at appropriate levels.

Two aspects of people factors were examined. The nurses' confidence in completing the skilled nursing procedures is an indicator of whether the nurses are adequately prepared, generally through basic nursing education, to provide hospital care. The second aspect of people factors, the how-to knowledge, was assessed to determine whether the reported nursing practice follows the how-to recommendations in the guidelines. Both people factors were found to be strengths within the delivery of appropriate care. The nurses report being extremely confident in their ability to complete the necessary skills which are completing vital signs and nursing assessment, recognizing worsening respiratory distress, administering oxygen, measuring oral

and intravenous intake for children, and administering antibiotics to children. The nurses' confidence suggests adequate preparation and is a strength in implementation of the guidelines.

The mean responses indicated each of the how-to knowledge aspects of the guidelines were described as either "usually" (over 75% of the time) being practiced for 13 nursing care recommendations, or practiced "often" (over 50% of the time) for 4 nursing care recommendations. The two of the four nursing care practices reported to be practiced "often" instead of "usually", were related to indicators for the administration of oxygen. The nurses indicated oxygen saturation was often measured on admission, and oxygen was often delivered until the respiratory rate is less than 70 breaths per minute and the retractions are resolved. Both of these practices could be affected by equipment and supply issues and not solely related to "how-to" knowledge defect. The third mean response of "often" was to the question of whether intramuscular injections of antibiotics are given on the upper, outer buttocks for children over 2 years of age. This choice of injection sites is a nursing decision which may be affected by local practice and not likely to have a severe impact on patient outcomes. The last response of "often" practiced was whether a daily record of intake was maintained, which is an important aspect of nursing care for children who are at increased risk of dehydration Maintaining accurate records is nursing how-to knowledge, but may be affected by inadequate nursing time. Nursing education targeting the importance of recording intake may increase the practice. None of the WHO recommendations were reported as being practiced sometimes or rarely. The people factor of how-to knowledge is a strength in the implementation of the guidelines.

Overall, the results indicate nursing practice is consistent with the recommendations of the WHO 'Pocket book of hospital care for children' for care of children with pneumonia, showing the full adoption of the guidelines.

The last component examined was awareness of the WHO guidelines. The mean response indicated the nurses were often aware of the guidelines and felt the guidelines were sometimes being followed. The staff reported they do not have access to the 'Pocket book of hospital care for children'; however they receive information based on WHO recommendations from the Senegalese Ministry of Health. Seven of the 11 participants indicated in their written responses to the open ended question 'What would help me to better care for children with pneumonia?' that they needed continuing education to improve care. Although the practice reported is consistent with the recommendations, without access to the guidelines, the nurses may not feel adequately informed.

Discussion: This study is the first known assessment of pediatric inpatient nursing care in a Senegalese hospital, and also the first known study with the participation of Senegalese nurses to provide information about the nursing care of children in Senegal.

The adoption of the WHO guidelines for the hospital care of children with pneumonia is a significant finding, and the hospital and all staff should be commended for their ability to provide care which has been demonstrated to prevent pediatric mortality. The nurses reported practice is consistent with the recommendations, although they do not have access to the actual written guidelines They reported feeling that continuing education is needed to improve care. Prior studies in sub-Saharan African hospitals report inadequate nursing knowledge and inappropriate nursing practice; however this study found adequate nursing knowledge and appropriate nursing practice. In fact, the Diffusion of Innovation component of people factors which are assessed by nursing preparation and how-to knowledge, are found to be strengths in the guideline adoption.

Two other issues identified in prior studies are identified as barriers to guidelines adoption in this setting. Both barriers are in the Diffusion of Innovation component of guideline factors. The moderately significant impact on the delivery of care due to the time constraints may be an indication of inadequate staffing, and inadequacy of nursing staffing create barriers to the implementation of the guidelines. Further study is needed to determine the appropriate number of daily nursing hours needed. Hospital Youssou M'bargane Diop in the Rufisque district may not have adequate registered nurses due to the shortage of registered nurses in Senegal, which is another area for investigation.

The second guideline factor found to be a barrier to guideline adoption is the adequacy of necessary materials. Maintaining adequate supplies and functional equipment should be a priority, with the need for additional oxygen delivery systems being particularly acute. A clinical study of the care being delivered, with correlation to patient outcomes, would determine if a lack of supplies and/or equipment is affecting patient outcomes. Establishing appropriate par levels for the pediatric unit based on average patient needs is recommended. Although the provision of equipment and supplies is within the domain of the hospital administration, sufficient financial resources may not be available to achieve this goal. Financial resources may need to be investigated.

Interpretation and implications:

Using the 'Diffusion of Innovation' theory to assess components in the process of adopting of the guidelines identified the strengths in people factor component, and the barriers to adoption were identified in the guideline factor component.

The adoption of the WHO recommendations for nursing practice indicates the nurses are knowledgeable and involved team members. Their efforts are supported by identifying and

acknowledging the care they provide for ill children. This strength suggests nurses should be actively involved in the implementation of guidelines within hospitals. The priorities for this facility should be the provision of adequate materials and ensuring adequate nurse staffing. Although these findings cannot be generalized to other settings, the sharing of information may assist others in identifying issues and finding common solutions. A study to assess clinical care with correlation to patient outcomes might confirm the findings of this study, which may have been influenced by the use of self-reported data and a small sample size. Also, further study to compare nursing care with WHO recommendations for other disease processes would be helpful to ensure an integrated child health management program is available at the hospital.

The results of this study may be helpful in three areas; to offer support for the strengths identified, to recommend guiding resources towards reducing barriers; and affirm to the community that the hospital is capable of providing guideline consistent care, which may encourage caretakers to seek of health care services for children with pneumonia and reduce mortality.

This international nursing study supports the involvement of nurses in the research process, which is not commonly found in developing countries where nursing research is in the early stages of development. Utilizing the nurses' voice in the research process provides valuable information, in addition to encouraging further nursing research in low resource settings. International nursing communication and support is possible across language and cultural differences, resulting in a beneficial exchange of nursing knowledge.

References

Baker, T. (2009). Critical care in low income countries. *Tropical medicine and international health,* 14(2), 143-148.

Catto, A., Zgaga, L., Theodoratou, E., Huda, T., Nair, H., Arifeen, S., Rudan, I., Duke, T. & Campbell, H. (2011). An evaluation of oxygen systems for treatment of childhood pneumonia. *BMC Public Health,* 11 supplement 3:S28.

Duke, T., Wandi, F., Jonathan, M., Matai, S., Kaupa, M., Saavu, M., Subhi, R., & Peel, D. (2008). Improved oxygen systems for childhood pneumonia: a multihospital effectiveness study in Papua New Guinea. *Lancet,* 372 (9646), 11328-33.

Enarson, P, Gie, E., Enarson, D. & Mwansambol, A. (2009). Development and implementation of a national programme for the management of severe and very severe pneumonia in children in Malawi. *PLoS Medicine,* 6(11).

English M., Esamai F., Wasunna A., Were F., Ogutu B., Wamae A., Snow, R., & Peshu, N. (2004). Delivery of health care at the first-referral level in Kenya. *Lancet* 364, 1622-1629.

Eshave, P., Bille, J., Audet, C., Talla, I., Vaudaus, B. & Gehri, M. (2003). Percentage, bacterial etiology and antibiotics susceptibility of acute respiratory infection and pneumonia among children in rural Senegal. *Journal of Tropical Pediatrics,* 49(2), 28-32.

International vaccine access center [IVAC], 2012. Pneumonia Progress Report 2012. Johns Hopkins Bloomburg School of Public Health Report, http://www.jhsph.edu/research/centers-and-institutes/ivac/resources/IVAC-Pneumonia-Progress-Report-2012.pdf, accessed June 26, 2014.

McIntosh, K. (2002) Community-acquired pneumonia in children. *New England Journal of*

Medicine, 346(6), 429-37.

Nolan, T., Angos, P., Cunha, A.., Muhe, L., Qazi, S., Simoes, E., Tamburlini, G., Weber, M. & Pierce, N. (2001). Quality of hospital care for seriously ill children in less-developed countries. *Lancet*, 357(9250), 106-10.

Reyburn, H., Mwakasungula, E., Chonya, S., Mtei,F., Bygbjerg, I., Poulson, A., & Olomi,R., (2008) Clinical assessment and treatment in paediatric wards in the north-east of the United Republic of Tanzania. *Bulletin of the World Health Organization*, 86(2), 132-9.

Rudan, I., Tomaskovic, L., Boschi-Pinto, C., & Campbell, H. (2004). Global estimate of the incidence of clinical pneumonia among children under five years of age. *Bulletin of the World Health Organization*, *82*(12), 895-903.

Sylla, A., Gueye, E. H., N'diaye, O., Sarr, C. S., Ndiaye, D., Diouf, S., Fall, L., Moreira, C., & Sall, M. G. (2007). [Low level educated community health workers training: A strategy to improve children access to acute respiratory treatment in Senegal]. [Article in French] *Archives De Pediatrie*, 14(3), 244-248.

United Nations Children's Fund [UNICEFa], (2014*). Levels and trends in childhood mortality, Report 2012*. New York, New York.

United Nations Children's Fund [UNICEFb], (2014). *State of the world's children 2014, Every child counts*. New York, New York.

United States Agency for International Development (2011). Retrieved from: senegal.usaid.gov/sites/default/files/FS_Health_8_10_FINAL.pdf

World Health Organization [WHO b] (2013). *Global Health Workforce Statistics.* Geneva, Switzerland. Retrieved from: Who.int/hrh/hwstats/en, Accessed on November 20, 2014

Appendix C

Survey, English

Nursing Care for Children Hospitalized with Pneumonia

Please check the box that best describes your care of children with pneumonia:	**Never 0% of the time**	**Rarely Less than 25% of the time**	**Some-times 25-50% of the time**	**Often 50-75% of the time**	**Usually over 75% of the time**
Antibiotics are given at the correct time					
Children with severe or very severe pneumonia are given antibiotics by intravenous or intramuscular route					
Children under 2 years of age are given intramuscular injections only in the lateral thigh					
Children over 2 years of age are given intramuscular injections only in the upper outer buttocks					
Oxygen is delivered to children with very severe pneumonia and/or respiratory distress					
If oxygen is being delivered, the oxygen system is checked at least every 3 hours to be sure it is connected, in place and functioning					
Children with severe or very severe pneumonia have their oxygen saturation measured on admission if oximetry is available					
When oxygen saturation measurement is not available, oxygen is delivered until the child's breathing rate is less than 70 breaths per minute and chest indrawing is resolved					
Suction equipment is available and used to clear secretions when the child with pneumonia cannot clear the secretions					
Children with severe pneumonia are assessed by a nurse at least every 6 hours					
Children with very severe pneumonia are assessed by a nurse at least every 3 hours					

Please check your response to the following statements:	Never 0% of the time	Rarely Less than 25% of the time	Some-times 25-50% of the time	Often 50-75% of the time	Usually over 75% of the time
A written record is maintained for each child with documentation of the nursing assessment					
Heart rate, respiratory rate and temperature are measured at each assessment and written in the record					
The level of consciousness and ability to take oral fluids is noted with the nursing assessment					
A record of the daily intake of the child's drinking, eating and breastfeeding is maintained					
Liquids and/or medications are given through a nasogastric tube when children are unable to take oral liquids and medications					
The child's weight is measured and recorded at the time of admission					
Nurses are familiar with the care of children with pneumonia recommendations from the 'Pocket Book of Hospital Care for Children'					
The recommendations from the 'Pocket Book of Hospital Care for Children' are followed when caring for children with pneumonia					

Please rate your confidence in your ability to:	Not at all confident	Somewhat confident	Moderately confident	Very confident
Measure pediatric vital signs and weight				
Administer oxygen to children				
Recognize worsening respiratory distress				
Measure oral and IV intake for children				
Administer antibiotics to children				

How significantly does each item affect your ability to complete an assessment, weight and vital signs for children with pneumonia?	**Not significant**	**Slightly significant**	**Moderately significant**	**Extremely significant**
The equipment is available				
Proper training was given				
Enough time is available				
How significantly does each item affect your ability to administer antibiotics?	**Not significant**	**Slightly significant**	**Moderately significant**	**Extremely significant**
Antibiotics and/ or supplies for administration are available				
Proper training was given				
Enough time is available				
How significantly does each item affect your ability to administer oxygen to children with pneumonia?	**Not significant**	**Slightly significant**	**Moderately significant**	**Extremely significant**
Oxygen and/or oxygen supplies are available				
Proper training was given				
Enough time is available				
How significantly does each item affect your ability to give nasogastric medications or liquids?	**Not significant**	**Slightly significant**	**Moderately significant**	**Extremely significant**
Nasogastric tubes and supplies are available				
Proper training was given				
Enough time is available				

How significantly does each item affect your ability to suction secretions if the child with pneumonia cannot clear secretions?	**Not significant**	**Slightly significant**	**Moderately significant**	**Extremely significant**
Suction supplies are available				
Proper training was given				
Enough time is available				

Optional question:

What would help me to better care for children with pneumonia?

Thank you for completing this survey!

Appendix D

Survey, French version

Enquête

Etude des soins infirmiers pour les enfants hospitalisés atteints de pneumonie

Veuillez cocher la case qui décrit le mieux votre soin des enfants atteints de pneumonie:	**Jamais 0% du temps**	**Rarement moins de 25% du temps**	**Parfois 25 à 50% du temps**	**Souvent 50 à 75% du temps**	**Habituellement plus de 75% du temps**
Des antibiotiques sont administrés au bon moment					
Les enfants atteints de pneumonie grave ou très grave reçoivent des antibiotiques par voie intraveineuse ou intramusculaire					
Aux enfants de moins de 2 ans sont faites les injections intramusculaires seulement dans la cuisse latérale					
Aux enfants de plus de 2 ans sont faites les injections intramusculaires seulement dans les parties extérieures supérieures des fesses					
L'oxygène est livrée à des enfants atteints de pneumonie très sévère et / ou de détresse respiratoire					
Si l'oxygène est livré, le système d'oxygène est contrôlé au moins toutes les 3 heures pour être sûr qu'il est connecté, en place et fonctionne bien.					
La saturation en oxygène des enfants atteints de pneumonie grave ou très grave est mesurée à l'admission si l'oxymétrie est disponible					
Lorsque la mesure de la saturation en oxygène n'est pas disponible, l'oxygène est livré jusqu'à ce que le taux de respiration de l'enfant se situe à moins de 70 respirations par minute et toutes rétractions intercostales soient résolues					
Un équipement d'aspiration est disponible et utilisé pour aspirer les sécrétions quand l'enfant atteint de pneumonie est incapable de les éliminer lui-même					

Veuillez cocher la case qui décrit le mieux votre soin des enfants atteints de pneumonie:	**Jamais 0% du temps**	**Rarement moins de 25% du temps**	**Parfois 25 à 50% du temps**	**Souvent 50 à 75% du temps**	**Habituellement plus de 75% du temps**
Les enfants atteints de pneumonie sévère sont évalués par une infirmière au moins toutes les six heures					
Les enfants atteints de pneumonie très grave sont évalués par une infirmière au moins toutes les trois heures					
Veuillez vérifier votre réponse aux affirmations suivantes:	**Jamais 0% du temps**	**Rarement moins de 25% du temps**	**Parfois 25 à 50% du temps**	**Souvent 50 à 75% du temps**	**Habituellement plus de 75% du temps**
Un dossier médical est établi pour chaque enfant avec documentation de l'évaluation des soins infirmiers					
La fréquence cardiaque, la fréquence respiratoire et la température sont mesurées à chaque évaluation et écrites dans le dossier					
Le niveau de conscience et la capacité de prendre des liquides par voie orale sont notés avec l'évaluation des soins infirmiers					
Un enregistrement de l'apport quotidien en liquide, en nourriture et en lait maternel est maintenu					
Les liquides et / ou médicaments sont administrés par un tube nasogastrique lorsque les enfants sont incapables de prendre des liquides et des médicaments par voie orale					
Le poids de l'enfant est mesuré et enregistré au moment de l'hospitalisation					
Les infirmières connaissent bien les recommandations concernant les soins d'enfants atteints de pneumonie tirées du livre de poche 'Soins hospitaliers pédiatriques, prise en charge des affections courantes dans les petits hôpitaux'					

Veuillez vérifier votre réponse aux affirmations suivantes:	**Jamais 0% du temps**	**Rarement moins de 25% du temps**	**Parfois 25 à 50% du temps**	**Souvent 50 à 75% du temps**	**Habituellement plus de 75% du temps**
Les recommandations du livre de poche 'Soins hospitaliers pédiatriques, prise en charge des affections courantes dans les petits hôpitaux' sont suivies lors du soin des enfants atteints de pneumonie					

Veuillez évaluer votre confiance dans votre capacité à :	**Pas du tout confiant**	**Plutôt confiant**	**Moyennement confiant**	**Très confiant**
Mesurer les signes vitaux de pédiatrie et le poids				
Administrer de l'oxygène aux enfants				
Reconnaître l'aggravation de la détresse respiratoire				
Mesurer l'absorption orale et intraveineuse des enfants				
Administrer des antibiotiques aux enfants				
Veuillez indiquer, dans chaque cas, l'effet de chaque élément sur votre capacité à procéder à une évaluation, à prendre le poids et les signes vitaux des enfants atteints de pneumonie?	**Non significatif**	**Peu significatif**	**Modérément significatif**	**Extrêmement significatif**
L'équipement est disponible				
Une formation adéquate a été donnée				
Assez de temps est disponible				
Veuillez indiquer, dans chaque cas, l'effet de chaque élément sur votre capacité à administrer des antibiotiques	**Non significatif**	**Peu significatif**	**Modérément significatif**	**Extrêmement significatif**
Les antibiotiques et des équipements pour administrer des antibiotiques sont disponibles				
Une formation adéquate a été donnée				
Assez de temps est disponible				

Veuillez indiquer, dans chaque cas, l'effet de chaque élément sur votre capacité à administrer de l'oxygène aux enfants atteints de pneumonie	**Non significatif**	**Peu significatif**	**Modérément significatif**	**Extrêmement significatif**
L'oxygène et des équipements pour administrer de l'oxygène sont disponibles				
Une formation adéquate a été donnée				
Assez de temps est disponible				
Veuillez indiquer, dans chaque cas, l'effet de chaque élément sur votre capacité à donner des médicaments ou des liquides nasogastriques	**Non significatif**	**Peu significatif**	**Modérément significatif**	**Extrêmement significatif**
Des tubes nasogastriques et des équipements d'administration sont disponibles				
Une formation adéquate a été donnée				
Assez de temps est disponible				

Veuillez indiquer, dans chaque cas, l'effet de chaque élément sur votre capacité à aspirer les sécrétions si l'enfant atteint de pneumonie n'est pas capable de les éliminer lui-même	**Non significatif**	**Peu significatif**	**Modérément significatif**	**Extrêmement significatif**
Des fournitures et équipements d'aspiration sont disponibles				
Une formation adéquate a été donnée				
Assez de temps est disponible				

Question facultative:

A votre avis, qu'est-ce qui pourrait m'aider à améliorer les soins pour les enfants atteints de pneumonie?

Merci d'avoir répondu à ce sondage!

Appendix E

Survey Instructions, English

Registered Nurses who have cared for hospitalized children with pneumonia:

Your participation in the study is completely voluntary. You do not need to answer any questions for which you do not feel comfortable giving a response. You have the right to withdraw from the study prior to submitting the completed survey, without penalty. All returned surveys will be used in the study.

If you agree to participate in this study, please complete this survey and place it in this envelope and seal after completing. Completing the study will take about 10 minutes of your time. There are no anticipated risks for participating in this study. There are no direct benefits to you for participating in this research study.

Your data will be anonymous which means that your name will not be collected or linked to the data. Individual results will not be reported or shared. The information will be complied into an electronic file and all individual surveys will be destroyed.

The compiled results will be used to describe the hospital nursing care of children with pneumonia in a first level health facility and compare the care to the World Health Organization guidelines for hospital nursing care of children with pneumonia.

Please return the sealed envelope to the physician by August 4, 2014.

Your honest and thoughtful responses are greatly appreciated. 2,500 CFA will be provided to compensate you for your consideration and time.

Please contact Khadija Diane Dramé at dmk4w@virginia.edu if you have any questions.

Thank you for participating in this study!

Appendix F

Survey Instructions, French version

Aux Infirmières et infirmiers qui ont pris soin des enfants hospitalisés atteints de pneumonie:

Votre participation à l'étude est entièrement volontaire.

Vous n'avez pas besoin de répondre à toutes les questions pour lesquelles vous ne vous sentez pas à l'aise de donner une réponse. Vous avez le droit de vus retirer de l'étude avant de soumettre le questionnaire rempli, sans pénalité. Tous les questionnaires rendez seront utilisés dans l'étude.

Vous avez le droit de vous retirer de l'étude à tout moment sans pénalité. Si vous acceptez de participer à cette étude, veuillez remplir ce questionnaire, l'insérer dans cette enveloppe et sceller l'enveloppe après.

Il vous faudra environ 10 minutes pour répondre au questionnaire.

Participer à cette étude ne devrait comporter aucun risque pour vous et ne s'accompagne d'aucun avantage direct.

Vos coordonnées et renseignements personnels ne seront pas divulgués. Les résultats individuels ne seront pas signalés ou partagés et vos réponses seront compilées dans un fichier électronique et toutes les enquêtes individuelles seront détruites.

Les résultats compilés seront utilisés pour décrire les soins infirmiers hospitaliers des enfants atteints de pneumonie dans un centre de santé primaire et les comparer ensuite aux directives de l'Organisation Mondiale de la Santé pour les soins hospitaliers des enfants atteints de pneumonie.

Prière de remettre l'enveloppe scellée au médecin avant le 4 Aout, 2014.

Vos réponses honnêtes et réfléchies sont grandement appréciées. En guise de remerciement pour votre temps et votre attention il vous sera remis 2,500 CFA.

Veuillez contacter Khadija Diane Dramé à dmk4w@virginia.edu si vous avez des questions.

Nous vous remercions de votre participation à cette étude!

Appendix G

July 24, 2014

Diane Drame and Mary Gibson
Academic Divisions
313 8th St NW
Charlottesville, VA 22903

Dear Diane Drame and Mary Gibson:

Thank you for submitting your project entitled: "Assessment of the adoption of the World Health Organization recommendations for hospital nursing care of children with pneumonia in Senegal" for review by the Institutional Review Board for the Social & Behavioral Sciences. The Board reviewed your Protocol on July 24, 2014.

The first action that the Board takes with a new project is to decide whether the project is exempt from a more detailed review by the Board because the project may fall into one of the categories of research described as "exempt" in the Code of Federal Regulations. Since the Board, and not individual researchers, is authorized to classify a project as exempt, we requested that you submit the materials describing your project so that we could make this initial decision.

As a result of this request, we have reviewed your project and classified it as exempt from further review by the Board for a period of four years. This means that you may conduct the study as planned and you are not required to submit requests for continuation until the end of the fourth year.

This project # 2014-0277-00 has been exempted for the period July 24, 2014 to July 23, 2018. If the study continues beyond the approval period, you will need to submit a continuation request to the Board. If you make changes in the study, you will need to notify the Board of the changes.

Sincerely,

Tonya R. Moon, Ph.D.
Chair, Institutional Review Board for the Social and Behavioral Sciences